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T. Y. Lin

"THE FATHER OF PRESTRESSED CONCRETE": TEACHING ENGINEERS, BRIDGING RIVERS AND BORDERS, 1931 TO 1999

Includes an Interview with
Margaret Lin

With an Introduction by
Alex C. Scordelis

Interviews Conducted by
Eleanor Swent
in 1999

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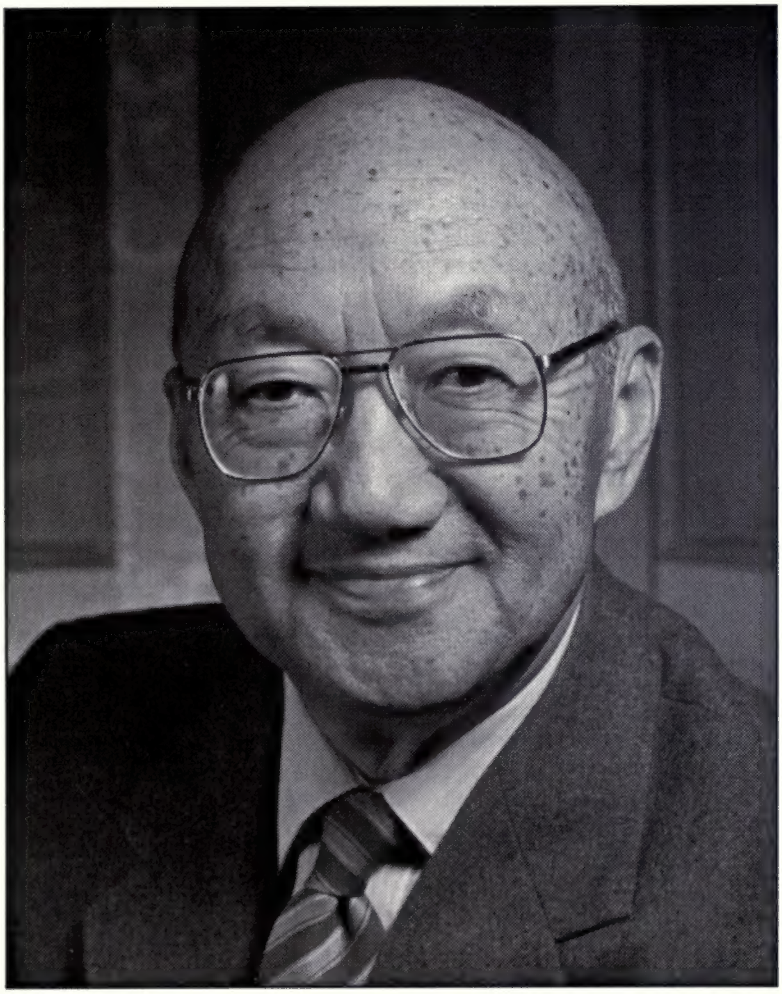

Tung-Yen Lin, circa 1988.

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Lin, Tung Yen (b. 1911) Civil Engineer

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Lin and Guo family history in China; education at home, and at American Methodist School, Jiao Tong University, 1927-1931, and UC Berkeley, 1931-1933; engineer, Chinese Ministry of Railways, 1933-1945; professor of engineering, UC Berkeley, since 1946; organizing 1957 world conference, promoting prestressed concrete technology; formation of T. Y. Lin companies, construction of Caracas racetrack, Managua Bank of America, Moscone Center, Kuwait harbor, buildings in Puerto Rico, Kuala Lumpur, Phoenix; building arch and cable bridges: Hegenberger, Idaho, Kwang Du, Rio Colorado, Twin Cities Mississippi River, Kwang Fu, I-205 at Portland, and others; bridges not built, Ruck-a-Chucky, Bering Strait, Gibraltar Strait; development of Pudong project, Shanghai, 1980, and influencing Chinese leaders; comments on Buckminster Fuller, Frank Lloyd Wright, Ronald Reagan; critiques of Bay Area bridges, thoughts on optimization. Includes supplementary interviews: wife Margaret Lin on life in wartime China, life in America; colleagues Ben C. Gerwick, Jr., Mark Ketchum.

Introduction by Alexander Scordelis, engineering professor emeritus, UC Berkeley.

Interviews conducted in 1999 by Eleanor Swent, Regional Oral History Office, The Bancroft Library, University of California, Berkeley.

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T. Y. Lin Foundation
University of California, Berkeley, College of Engineering

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INTRODUCTION by Alex C. Scordelis

For half a century, I have been witness to the brilliance of T. Y. Lin. It is a brilliance that illuminates not only from his mind but from his heart, not only from the excellence of his innovations but from the warmth of his intentions, not only from his pioneering work but from his visionary spirit. He is an extraordinary man, with a deep love for the University of California, Berkeley. I am delighted that his university has produced this history, in his own words, for generations to come.

Before there were expressions like "think outside the box" or "push the envelope," T. Y. was doing just that. He can quickly see an engineering project or problem in all its complexity and visualize a solution. He is motivated by a desire to improve things, to do better than before in creating solutions to problems of engineering and beyond. In a career spanning seven decades, T. Y. has continued to grow, always with a more challenging project and a new idea.

I met T. Y. when I joined the Berkeley faculty in 1949. I had left the service in 1945 after World War II, returned to Berkeley to complete my undergraduate degree, and finished graduate work at MIT before coming back to Cal as an assistant professor. T. Y. had joined the civil engineering faculty three years earlier, in 1946, wooed from his native China by Berkeley faculty who still recalled his impressive work as a Cal graduate student thirteen years earlier. In those early days on the faculty, four of us young professors shared office space on the third floor of the old Engineering Materials Lab--Ray Clough, Karl Pister, Egor Popov, and me. On the second floor was a small classroom, and several times a week a distinctive voice--with its considerable accent, volume, and enthusiasm--would ring through our offices. Who was this fellow? I knew I had to get to know T. Y. Lin better.

Drawn together by our common interests in reinforced and prestressed concrete, T. Y. and I began a research collaboration that would last nearly a decade, publishing joint papers from 1953-59. This era was the dawning of T. Y's groundbreaking work in prestressed concrete, a method of combining concrete with steel tendons for a stronger, lighter building material and more efficient, economical structures. Prestressed concrete was new and untried in the United States at the time, but backed by our experiments and analysis in the lab, T. Y. became its leading proponent (along with our long-time colleague Ben C. Gerwick, Jr., then in private practice and years later a member of the Berkeley faculty).

T. Y. successfully promoted prestressing to the forerunner of the California Department of Transportation (CalTrans), which after World

War II was charged with developing huge highway projects for the state. CalTrans took an interest in our research, forming a tie with Berkeley engineers that is still strong today and has had a major impact on the university's research programs and on the evolution of structural design and earthquake engineering.

Excited by the potential of this new building material, T. Y. was the driving force in assembling the first World Conference on Prestressed Concrete in the summer of 1957. Some 1,200 engineers, scientists, and manufacturers--with the rare inclusion of a delegation from the Soviet Union--gathered for the conference in San Francisco, drawn together by T. Y.'s diligence and enthusiasm. The results of this international gathering, coupled with T. Y.'s pioneering work to perfect the use of prestressed concrete, changed the history of building, making possible today's high-rises and graceful long-span structures that can bear heavy loads, withstand earthquakes and hurricanes, and cost little to maintain.

With a strong interest in engineering practice, T. Y. founded T. Y. Lin International in 1954, but he continued to work tirelessly on his university research and teaching, adding new dimensions to the civil engineering program at Berkeley. As chair of the Division of Structural Engineering, he convinced the campus that we needed a new structures lab, spearheading the development of experimental facilities at the Richmond Field Station that still flourish today.

T. Y. was long one of the campus's most exuberant teachers--most structural engineering and architecture alumni will tell you of their clear memories of T. Y. Lin lectures. At first, it might have been his accent that caught their attention, as they leaned forward to catch the words and the rhythm of his speech. Next he drew them in with his enthusiasm for his subject and the energy of his ideas. But ultimately it is his vision and the clarity of his engineering mind that his students recall. In 1968 he was appointed to the unique campuswide post of Professor of Arts and Science, recognizing his ability to offer students in all disciplines a distinguished perspective on science, art, and society. From his earliest days at Berkeley until today, he has had an untiring willingness to teach students at all levels--he continues to be a popular lecturer, fascinating and inspiring students in a new millennium.

During his Berkeley career, T. Y.'s engineering interests continued to broaden, until in 1976, after thirty years on the faculty, he became professor emeritus to take on the full-time role of chairman of T. Y. Lin International. Over the next twenty-five years, I consulted with T. Y. and his company on many projects, including several graceful and innovative designs of large arenas, long-span bridges, and shell and spatial structures. We enjoyed many successes, but also the occasional setback or missed opportunity. I might have grumbled over problems, but T. Y. often counseled me, saying, "Alex, we have to look ahead. Be positive. If we lose this one, look for the next." It is an attitude that is his hallmark.

In a 1987 profile of T. Y., a reporter wrote, "Long before the computer has told him his dream can be built, T. Y. knows." His remarkable vision is based on this engineering intuition. He has proposed a "Peace Bridge" linking Siberia and Alaska across the Bering Strait and a bridge spanning the Strait of Gibraltar from Spain to Morocco. (When President Reagan handed him the National Medal of Science in 1986, T. Y. handed back a pamphlet describing his Bering Strait dream.) Some have disparaged these visions as unworkable or impractical, but to me they embody T. Y.'s drive, imagination, and amazing mind.

Wherever his dreams and career have taken him, T. Y. has always thought of Berkeley, his alma mater. "To have an education like what I had was a very rare thing," he has said of his opportunity to study at Berkeley in the early 1930s. "Once you have it, you do something for other people, not just for yourself." Beyond his professional contributions, he has been an ardent supporter of the campus. The Lins established the T. Y. and Margaret Lin Chair in Engineering and an endowment fund to benefit the College of Engineering. Through the T. Y. Lin Foundation, a major structural engineering lecture-demonstration laboratory was constructed in Davis Hall and fellowships were endowed in both structural engineering and architecture. He has been an adviser to a succession of deans of the College of Engineering and an ambassador for Berkeley's excellence the world over.

"Once in a generation, a man is born whose mind sparkles like a constellation of stars. T. Y. Lin is such a man, an engineer whose operations have covered east and west, north and south--a master of creativity on the entire globe." These are words that an admirer sent to the Department of Civil Engineering on T. Y.'s retirement. Truly, T. Y.'s sparkling mind has radiated energy, optimism, revolutionary innovation, and inspiration, leaving an enduring mark on his students and colleagues, his profession and his university.

Alex C. Scordelis
Nishkian Professor Emeritus
of Structural Engineering

January 16, 2001
University of California, Berkeley

INTERVIEW HISTORY--Tung Yen Lin

T. Y. Lin's oral history documents a successful career in building bridges both actual and cultural: as a popular university professor of engineering, as head of a major structural engineering firm, and as a classically educated Chinese gentleman and scholar who excels in innovative use of Western technology. In 2000, Professor Lin traveled to Washington, D.C., to receive the highest honor in his profession, the first OPAL award of the American Society of Civil Engineers. Among the hundreds of awards he has received, he prizes the National Medal of Science given to him by President Ronald Reagan, and the award of merit given by the American Consulting Engineers Council, and previously given to Presidents Herbert Hoover and Dwight Eisenhower. His four books and other publications, with their translations into many languages, make a stack four feet high.

It was a singular pleasure for me to receive the invitation in March 1999 to tape record the recollections of T. Y. Lin, as it culminated more than thirty years of my own interest in and concern for Chinese in America. For twenty years I had taught English as a Second Language to adult refugees and immigrants in the Chinatown of Oakland, California. I had read something of Chinese history; I had visited China three times as a tourist. More recently, I was involved in documenting the history of engineering instruction at the University of California at Berkeley. I had met associates of Professor Lin, and had heard much about his accomplishments.

The letter of invitation to record the oral history was sent to T. Y. Lin on 21 May 1999 and he promptly accepted. We first met on 18 June 1999 at the Lin home in El Cerrito for a planning session. Eleven interviews followed at regular intervals: 22 and 29 June; 3, 10, 18, 24 August; 7, 14, 21 September; 4 and 19 October. On September 11 and October 4, 2000, we met again at Lin's home to discuss the 100 photographic slides which are an important supplement to the story of his career. His analysis of the slides was tape-recorded and the unreviewed draft transcript accompanies the slides which are deposited in The Bancroft Library. They include personal and family photos, as well as photos of drawings, models, and actual structures of his major engineering projects. Although much of this discussion repeated material already contained in more dispersed form in the oral history interviews, the dedicated researcher will find it valuable.

The interviews with one exception were held on Tuesday morning because that is the day when his wife Margaret has her ballroom dancing lesson. She left us with covered mugs of dragonwell tea, chairs and tables positioned and ready for the tape recording session.

We met last on 26 January 2001 to select photos for the volume. This time we sat at the dining table beside planters filled with bromeliads and cyclamens blooming profusely; Margaret as usual had left tea for us. T. Y. was excited over their coming trip to China in May, to deliver a lecture at the University in Nanjing, and also to visit Kwang-Xi where a company for which he is consultant is submitting plans for a signature bridge with cables hung from curved arches. The butterfly-like design, which he says is only possible because of computers, is reminiscent of his Ruck-a-Chucky bridge, which he designed before computers.

The Lin house is built of prestressed concrete, of course, and stands very high on a hill, commanding a view of all the San Francisco Bay bridges. The furniture is contemporary, Scandinavian modern style. A dramatic stylized painting of a bridge, done by a student, hangs over the fireplace. The ceilings are high and the western walls are of glass. At the first session, I took the liberty of moving a chair and placing a small stool beside it for the recorder; at the next session, the chair and stool had been placed exactly so for me.

If I arrived a few minutes early, I met T. Y., wearing a cloth cap and standing straight, returning from his morning walk. A soft-spoken man, he was unfailingly genial throughout the entire process. At all times, I had the feeling that we were working together on something that pleased him. He wanted Margaret to be interviewed, but there was some doubt that she would wish it. One week, however, we met on a day other than Tuesday, and she was hesitant but gracious in consenting to talk for the tape recorder, as she said, "just for ten minutes." Her story, which in fact took nearly two hours to tell, is a valuable addition to her husband's. She is as slim, straight, and graceful as a girl, perfectly manicured, usually dressed in simple sweater and pants. It was easy to imagine a young engineer falling in love at first sight with this daughter of a privileged family, a girl enamored of Hollywood stars seen in American films. It is shocking to hear her story of walking with bleeding feet through war-torn China, carrying her infant son on her back, and drying his diapers over a smoking fire of dung. An important part of the Lin success story is their obvious devotion to each other.

Before we met, I went through several cartons of the Lin papers which had been donated to The Bancroft Library. A good many of them were in Chinese, so I could only enjoy the photographs. There were complete files of the Peace Bridge Foundation and its plans for spanning the Bering Strait, and also of the plans for the Gibraltar bridge and the Ruck-a-Chucky bridge near Auburn, California. Lin's fame rests not only on structures that have withstood great earthquakes but also on some which exist only in his world-embracing dreams.

Background interviews were particularly helpful in facilitating the oral history. Everyone I talked with was enthusiastic about trying to capture the personality of T. Y. Lin and his way of looking at engineering problems. They emphasized his optimism, his infectious congeniality, and the fact that his buildings and bridges are admired throughout the world not only for their strength but also for their beauty. I tape-recorded interviews with Lin associates Ben C. Gerwick, Jr., and Mark Ketchum, which are included as appendices to this volume. I met with daughter Verna Lin Yee, who gave me insight into the importance of dance in her parents' life, as well as a feeling for the warmth of the family relationships. I spoke on the telephone with her husband, Robert Yee, business associate as well as family member; he contributed an affectionate written memoir. I spoke by telephone with associate Kam Lo; architecture critic Allen Temko; a cousin, Dr. T. H. Lin, professor of mathematics at UCLA; and his wife, who told me of T. Y. Lin's reputation in the family as a brilliant student.

I held telephone conversations with Professor Alexander Scordelis, the university colleague, neighbor, and friend who provided the introduction for the volume. Once when I mentioned to Professor Scordelis that T. Y. Lin had reviewed his transcript very promptly, Scordelis's comment was that T. Y. always does in one month what would take another person three months.

In his interview, T. Y. gives a candid account of promoting the use of prestressed concrete in the United States by writing a textbook and handbooks, organizing conferences, and working to have building codes revised. His story of working with Chinese leaders to promote the development of the Pudong district of Shanghai gives remarkable insight into the workings of Chinese government in the post-Mao era. He tells how he influences the leaders of China with his ideas of bridging cultures at the same time that he designs innovative structures to bridge the rivers there. He did not use notes for the interviews, but referred to photographs or slides of the structures under discussion. He clearly had in his mind an outline of what he wanted to say. Occasionally he would stop, pondering, evidently running down his mental list, and then would say, "Yes," and continue speaking.

T. Y. Lin is profoundly concerned with what he calls "optimization"--the Confucian concept of the golden mean--and blending the best of Chinese and Western cultures. In his final interview, he summed this up:

> In a philosophical way the [Chinese] classic says, "For every one of your actions, you want to reach the optimum." So that the rate of change is zero and the slope is equal to zero. This is $dY/dX=0$, period! The Newton approach is a mathematical one, expressed in numbers, but the Chinese philosophical approach and the Newton approach to optimization are actually the same.

When the interview process was complete, the tapes were transcribed in the Regional Oral History Office. In going over the transcript, I removed many of my own remarks, such as "Oh, my!" which interrupted the flow in reading. Occasionally Professor Lin's voice trailed off into an "Aaaah" or a murmur. These utterances are omitted from the transcript.

When the lightly edited transcript was sent to Professor Lin for review, he returned it very promptly, with an accounting of the hours he had spent on it, and numerous changes clearly marked. Most of these changes were for clarification only. Although his speech is strongly accented, his vocabulary and grammar are impeccable. In his review, he corrected most of the occasional omission of articles and lapses in verb tenses. The transcript was corrected, amended, and indexed at our office. The tapes are deposited in The Bancroft Library and are available for study.

Kenneth Sanderson undertook the heroic job of indexing the manuscript. The transliteration of Chinese words and the different styles of nomenclature presented some difficulty. We chose wherever possible to use the most recent [pinyin] spelling of proper names. In some cases, we chose to accept a previous usage: for example, Margaret speaks of Hankow, and we left that usage in the text, but indexed it also under the modern designation, Wuhan. Similarly, we left the word Foochow as it was at the time being discussed, rather than the current form Fuzhou. The decision on use of hyphens was made arbitrarily: Lee Kwan Yu, Mao Zedong, and Yuan Shi-Kai are the most common forms of these names, which we accepted, although they are not consistent.

The introduction was written by Professor Alexander Scordelis, and T. Y. Lin Foundation provided funding for the oral history.

The Regional Oral History Office was established in 1954 to augment through tape-recorded memoirs the Library's materials on the history of California and the West. Copies of all interviews are available for research use in The Bancroft Library and in the UCLA Department of Special Collections. The office is under the direction of Ann Lage, Acting Director, and the administrative direction of Charles B. Faulhaber, The James D. Hart Director of The Bancroft Library, University of California, Berkeley.

Eleanor Swent, Interviewer/Editor

January 2001
Regional Oral History Office
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University of California, Berkeley

Regional Oral History Office
Room 486 The Bancroft Library

University of California
Berkeley, California 94720

BIOGRAPHICAL INFORMATION

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Date of birth 11/14/11 Birthplace China

Father's full name Ting Chang Lin

Occupation Supreme Ct Judge Birthplace China

China

Mother's full name Feng-Yi Kuo Lin

Occupation Housewife Birthplace China

Your spouse Margaret Lin

Occupation Housewife Birthplace Beijing, China

Your children Paul Yang Lin

Verna Lin

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Other interests or activities Poetry

Organizations in which you are active Engineering Societies

SIGNATURE T.Y. Lin

DATE: 11/9/00

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BIOGRAPHICAL INFORMATION

(Please write clearly. Use black ink.)

Your full name Margaret Lin

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Father's full name Shee Keò

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Your children Paul Young Lin
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SIGNATURE Margaret Lin DATE: 11/9/00

INTERVIEW WITH T.Y. LIN

I THE YEARS IN CHINA, 1911-1931

[Interview 1: June 22, 1999] ##[1]
[El Cerrito, California]

The Lin Family, about 1100 B.C.

Swent: You had said that you would like to begin with a little history of the Lin family. It goes back a long, long time in China.

Lin: Yes, Lee. First of all, I'd like to say, it's a great pleasure to be interviewed by you because you also have some background of China.

Swent: I do appreciate a lot about it.

Lin: So at your suggestion, I go back into the history of my family. So I'll start from the very beginning of the Lin family, about 1100 B.C.; now this is actually recorded somewhere. I had a copy but misplaced it somewhere. Anyway, the Lin family started during the Shang Dynasty, which ended about 1100 B.C. The emperor Zhou was a very wicked and terrible emperor. He killed all kinds of people--just executed them--but meanwhile, he was very powerful.

His brother, Bigan, was a very good man, who advised him not to be so cruel but to be a good, reasonable emperor. That made him mad. He said, "I understand that good people have seven hearts. So, I'll just see how many hearts you have."

So he cut open his stomach to show whether he has one heart or seven hearts; so he died. Then his wife escaped, somehow, into the field. And not long after, people rebelled against this wicked emperor Zhou and overthrew the dynasty.

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[1] ## This symbol indicates that a tape or tape segment has begun or ended. A guide to the tapes follows the transcript.

Swent: Did the wife have something to do with that?

Lin: Ah no, but she did bear the child and ran to the forest. Now the one who revolted successfully against the Shang dynasty, and started a new dynasty, known as Zhou dynasty, which ruled China for about another five to seven hundred years; really somewhat weak in the last two hundred years, so I say, five to seven hundred years.

Now this [Wen Wong] Emperor Wen was very good. So after he took office, he ordered people to go to the forest to locate Bigan's wife. They found her alive there, with her born child! [overcome with emotion; sheds tears] Funny, the old days! So, Emperor Wen gave him the name of "Lin," because he was found in the forest, and "lin" means forest.

Swent: Oh! So that was where the family got its name?

Lin: The authentic story of the family. [weeps again] And that is quite well known in China, certainly in the Lin family of course. So, Lin, from then on, under the Zhou dynasty, prospered very well, and thrived in Xian, the capital, and nearby areas. For centuries after centuries--

Swent: So this child of the forest was also the son of the previous emperor--

Lin: And thrived under the new dynasty. [laughter]

Swent: The wonderful family--

Lin: Yes, Zhou was a very bad emperor, but his fathers and grandfathers, something like four hundred years ago before he was enthroned, were very good. This is typical of a Chinese dynasty--you start out with a great emperor, and then it degraded, sometimes improved, but in the long run, in one hundred to several hundred years, good ones were gone. Not every generation was great.

Swent: You think that the mandate is turned over?

Lin: The mandate was turned over. Actually it required a revolution from the people.

Swent: Mandate of heaven?

Lin: Mandate of heaven, right. [laughter]

Swent: Is that a translation of something in Chinese?

Lin: That is the correct translation--mandate of heaven, moved it to the new emperor. Actually, the emperor won it by revolution. This thing repeated in China--I don't know how many times, twenty times, or whatever--until the modern era.

The Lin family was located in Xian until about the tenth century, about a thousand years ago. There was a big upheaval again. A lot of people rebelled against the rulers. Sometimes there were outside conquerors. So a lot of the Lin family moved from Xian to Fujian. That's about tenth century, A.D., some two thousand years after the first Lin.

Swent: That's a very long way to move!

Lin: Very long way. But they were escaping from the very tumultuous situation in Xian during the Tang dynasty. Many Lins moved to Foochou, and settled there. There was an interesting thing, which I found out but was confirmed by others--how the Fujian dialect speak of men and women. Woman is called "Zhu niang ren," which means Zhu women descendants. "Zhu" means the Zhu tribe; "niang ren" means woman. Men is "Tang boo ren" in Fujian dialect. "Tang boo" meaning the Tang group of men, because when they went in there, they killed all the local men, and married the women. So it's a mixed race: Chinese men mixed with the local women. I think there's some truth to this interesting and not recorded story. So the Lins settled in Fujian, about a thousand years ago.

Great-great-grandfather Lin: Wisdom Is Better Than Wealth

Lin: Some two hundred fifty years ago, the Lin family, my great-great-grandfathers did some trading business away from Fujian, which was a big port and trading city. Somehow they made a lot of money and became rich. They came back with dozens of boxes of jewels--jades, gold, silver--and the family became very rich through this trading. And then the old man enjoyed and passed on his wealth to his descendants, for about two to three generations, who wasted all the money and became quite poor again.

Swent: Do you have a saying in Chinese--I know there is one in Spanish and one in English. We say, a family goes from shirtsleeves to shirtsleeves in three generations?

Lin: Really? That sounds about right.

Swent: I thought there was something similar in Chinese. The great-grandfather is rich, and then they become poor.

Lin: Poor in three generations, because the sons and grandsons just wasted the money. That's what happened to the Lin family. At the end of that, the grandfather, on his death bed, called in his children, and gave them each a collection of Chinese classics [emotional; sheds tears]. Classic in Chinese is called "jing." The five classics, and the four books, are called "Wu Jing Si Su". Then he told his children, "Boys, this jing, the classics, is better than the other jing, which is gold." ("Jing" can mean gold or classics.) "So from now on, you study the classics, and never mind about gold." These children apparently took that to heart. Since then they studied very hard, and have been educating themselves for ten or twenty generations. So we have our Lin family-tree book describing each generation, who is doing what, and who is married to--I have this here, I don't know where it is, I may try to find it someday. But I think it is deposited at the Harvard library or somewhere, the so-called Lin family tree. It does not have the whole tree, because as of now, about one percent of all Chinese are Lins, which means twelve million Lins in China.

Swent: Is that one of the one hundred names?

Lin: Yes, it's within that, but not the most popular name. The number one name I believe is Chang, then comes Wang, then comes Chen, then comes Li. "Chang, Chen, Wang, Li", are the biggest names. I think one of them, the Chang family, must have about sixty million in China.

So our branch of the Lin family, since then, all tried to educate themselves, for the last two or three hundred years. Each of them was either a magistrate or a brigade general, had a good position in the government, for about twenty generations or more.

Learning the Five Classics from Grandfather

Lin: Now comes to my grandfather, who is one of those descendants. He was a magistrate of Wan Hsien, Sichuan Province. So he was pretty good. He had the degree of "ching se". "Ching se" is equivalent to about the doctor degree now we have, by passing then exams. Several before him were also of the same caliber; I cannot remember in detail.

So I had the opportunity of serving him and working with him, and being educated by him in the Chinese classics, in the beginning of the twentieth century.

Swent: Sichuan is not near Fujian, is it?

Lin: No, Sichuan is at the center of China. Wan Hsien is right near Chongqing. So he was in the interior of China as a magistrate.

Swent: Did you go there to see him?

Lin: No, when I stayed with him, he was getting old already. He was about seventy-five and had served his time already. So, he taught me Chinese classics. He asked me to write Chinese characters, and I was so lazy. I was supposed to hand in one written page in a week; I came up with only half page, didn't do my work at all, very lazy child, just want to play ball and so forth. But he is a very, very fine fellow. There are a lot of stories about him, which I do not know as much as some of my brothers and sisters. So he was quite a man.

Swent: What was his name?

Lin: Fu Hsi. Fu Hsi, now I remember he passed away about the year I went to school. After learning from him, he woke to the fact that in modern China one had to go to school. So he said I should go to school, also said my father and my brother. My brother already went to school.

So about the year 1924, he asked me to prepare to go to school. Now to go back to myself, I was born in 1912, lunar date, November 14, which I translated through some calendar, and found it to be actually December 21st, 1912. But lunar calendar is the eleventh month, fourteenth day, of the year 1912. Then, when I tried to enter grammar school, apart from the family teaching, I was too young, and the only class open for new students was--if I divide grammar school into six years, high school into six years--was the second year of the high school. I never had any grammar school.

Swent: Let me interrupt just a moment. Let's talk about your earlier schooling; there was your grandfather, but you haven't mentioned your father.

Lin: Oh, yes, yes, I forgot that. Anyway, let me make it up now. My education was mostly from my father--in fact, more than from the grandfather, but the grandfather did take some part, and my father. My brother also taught me. So I was taught by three older generations.

Swent: This is all at home?

Lin: All at home, this was before the year 1924, when I finally entered public education.

The Lin Family Compound in Beijing

Swent: Let's talk some more about your home. I'd like to know what kind of building, what your house was.

Lin: Oh, that's very interesting. Okay, we lived in Beijing. I and our family was moved to Beijing in the first year of the Chinese Republic, which was 1912. Maybe we moved to Beijing in 1913. I was one year or a few months old.

Swent: The Sun Yat-sen Revolution took place in 1912.

Lin: We probably moved in 1913, or sometime there, at the very beginning of the Republic. So I was too young to know anything.

Swent: Of course, but it affected your family--

Lin: Yes. And we moved to Beijing, stayed in a compound, Chinese old-fashioned house. The compound had three yards, and the rooms or houses were built around each yard. The three of them were in succession, the first yard, second, and the third one. So we, my father lived in one of those yards along one side of it. My uncles on the others. There must have been three or four uncles and their families, and other related uncles, who married my aunts, for example. So it's a big compound, I would guess housing over seventy people.

Swent: Plus the servants.

Lin: Plus the servants. Not too many servants, but nonetheless maybe a dozen of them.

Swent: They lived there also?

Lin: They lived there. They lived in certain portions, servants' quarters, door keepers and so on.

Swent: And your mother had fourteen children?

Lin: Yes. My mother gave fourteen births. Two of them died very young. One died maybe fourteen or something. The other eleven survived until now. As of now, two of my brothers passed away, both over seventy or eighty. My sisters are still alive. It so happens that all of them are now in the United States. As a result of the Communist Revolution, they all found that America is a better place and came to America. So that's the story--

Swent: And which child were you?

Lin: I had one elder brother, two elder sisters, three younger brothers, and four younger sisters. So I'm number four among the grownups. I was born in Foochow, moved to Beijing at one year old, and grew up in that compound. In that compound I studied all Chinese--there's a whole stack here, many things that I used to read and memorize, including Chinese poems, Chinese classics, the four books, theory of optimization, and Chinese history, and Chinese essays. [indicates pile of books on the coffee table]

Swent: And learning to read and write in Chinese takes a very long time.

Lin: Takes a long time, and to understand those classics is very difficult. They do not represent the prevalent or the local language. It's a language by itself, very classic, thousands of years old, very difficult to learn those things. But I learned these young, was taught by grandfather, father, and brother.

Swent: Was there a room in this compound that was a classroom where you went to study?

Lin: Okay, there is no classroom as such, but I went to my father's place, a room, someplace, or my room. We would not be taught in a special room for education, except they hired a Chinese teacher, to teach us, me and some other cousins and brothers. Then you have this one study room. Otherwise no such thing. It is totally a family deal. So I had this kind of education--

Swent: Tell me about your sleeping. How many people slept in your room with you?

Lin: I'll say about two or three, I remember, other brothers and sisters. Yes. So in our family, there's about a dozen people. We occupied five or six bedrooms.

Swent: What about eating?

Lin: Eating, each sub-family, like my father's family, would eat as a group. Generally, each one would have his own cook. It is possible that one cook would serve two families in the compound. Very close together, they played together, worked together, studied together. It was a very good life from the point view of company--you're never short of company. But the trouble is there was always some arguments among themselves, although not openly, such as, "I want to eat this;" "I want to go there." When you get over seventy in a compound, they may not have one opinion.

Still now I think back, the pros and cons of the two types of families, we here is a single couple family; when the child grows up, after college, he sort of naturally goes out and be by himself. So the family here is very small. It has certain good points: independence, lack of interference, but it does not have the company. Company of course is good and bad. [laughs] You got so much company, sometimes, it breeds all kinds of in-fights; you cannot not have open fight because our family would be ruled by the grandfather. If you have any trouble the grandfather would intervene, tell you to do this or that; he is the final judge. Although seldom we did have disputes, partly because we were able to get along. But I imagine they did not have the kind of freedom we have in this country.

Swent: I remember reading once a memoir by somebody who came to America about the same time that you did, to study--no, he was older than you--but he said that in this kind of upbringing there was no idea of private property either, that even his clothes were communal--

Lin: Absolutely.

Swent: Shared toys, clothes--

Lin: Toys, clothes, et cetera; with small exceptions, everything belonged to the whole family. And if one pair made more money, they would share with the others, although you may have the right to spend a little more yourself. But eventually they were all shared.

Everything is shared. So our grandfather lived here. He has three sons, and each of them will supply him with whatever he needs. There's no problem.

Swent: Now what about second wives? Did your grandfather and father have other wives?

Lin: No. However, I think back in history there must have been. My grandfather married once. Then his wife died; he never remarried. He had only one wife.

Swent: That was unusual?

Lin: It's very, very unusual not to remarry, and that happened to our grandfather. Now, great-grandfather married, and his wife died, and he remarried. Apparently got along all right, but no concubines at that time, for the generations that I was acquainted with.

If I go back twenty generations, there must have been some with concubines. I have no experience with that. If you look through the records, maybe they did have a concubine, it would be recorded.

Swent: Because it was the custom.

Lin: Yes. It was legal, normal.

Swent: A wealthy family.

Lin: Okay, our family was not wealthy, because as I said, some twenty generations ago, we were taught to be educated, not taught to be wealthy.

Swent: I see.

Father a Judge after the 1912 Revolution

Lin: In fact, since that time, we were never wealthy. So my father studied law. He was a judge since the Republic took over in 1912. I believe he was even a minor judge before that. He had a college education in law. He was paid very little, as all officials were.

##

Swent: You said that they paid very little, but had great prestige.

Lin: Well, as a judge, it's prestigious, and he took pride in that. He liked his work, and brought back all the cases to home, and worked on them at night, and he was known as a judge who had interest in making decisions and studying cases. He really enjoyed the work, held a prestigious position, but very low pay. The pay was not too low, maybe $200, but oftentimes the government in Beijing had no money to pay. So they would owe him a few months of salary or only paid half. So that made it very difficult.

Swent: Did he play any part in the revolution?

Lin: No. He was purely a judge. When there was a change, during the revolution it was very interesting, that's when I was in Beijing, being brought up. I saw several upheavals, from the time of Yuan Shih-kai--have you heard of him? Yuan Shih-kai was the first emperor, self-declared emperor, after the Ching dynasty was overthrown. At that time, I was in Beijing. I knew something--I was five or six years old. Every few years there would be an upheaval, and the government got a new boss. First, it was from the old Ching dynasty to Sun Yat-sen. Sun Yat-sen was succeeded by Yuan Shi-Kai; Yuan Shi-Kai was a general who took over, and declared himself emperor, in 1917 or something. So after him, came the warlords. The warlords include Wu Pei Fu and Chang Tso-lin. Chang Tso-lin was from Manchuria. And the Japanese murdered, assassinated him, by blowing up his train. Today, would be a new warlord ruling Beijing, and next day another. Just the time I went to school, so I remember that. So often I woke up, before I reached the school, there were sandbags in all the streets. There was a revolution every few years.

Swent: I would like to know more about your mother also.

Lin: Yes.

Swent: Did she have bound feet?

Lin: Yes! I think she had bound feet, but liberated, so it was not bad in walking. I think her feet were first bound during the Ching dynasty, but later liberated under the Republic of China--her feet were smaller than usual, but not bad. She was bound feet when she was young.

Swent: Were you aware of this as an issue at all?

Lin: I was not aware of it; a little bit, maybe--you know about it, but whether this was bad or not it was only what happened.

Swent: I have heard that it was also very painful when they were unbound.

Lin: Oh yes, but I think my mother was unbound earlier. So it's not that bad. It is a bad thing anyway.

Swent: Oh, it's terrible.

Lin: I wonder how that came about. Did that start from the Ching dynasty?

Swent: It lasted for a long time, I believe.

Lin: You see, when Ching conquered China, the Chinese people were Hans. The Ching people were Manchurians. So they tried all kinds of means to confine the Han people. The men were supposed to wear pigtails, and the women bound feet.

Swent: Did your father have the queue?

Lin: Not when I knew him, but maybe during the end of the Ching dynasty, he might have had, but that's before I was born, you see.

Swent: Your brothers and you did not?

Lin: No, no, we were not, I certainly--all of the brothers were not. At that time, near the end of the Ching dynasty, many things were changing already.

Swent: Your father must have been very liberal.

Lin: My father and my grandfather, both were very liberal. They knew a lot about the Western world, not as much as we do, but they knew that something was changing in the world.

Swent: Had they traveled at all?

Lin: They had not been to foreign countries. I always thought my father had been to Japan, for a short trip or something, but apparently not.

Swent: What about religion?

Lin: Religion in China, there is no such--we were all Confucianists, which was not a religion but just a teaching. We were very much Confucianists, reading the four books and five classics, so we were taught Confucianism, which as I said, is not a religion.

Swent: There was no Christian influence?

Lin: Okay, that's when I went to school. Now we'll talk about that.

Mother's Family, the Guo Family

Swent: I wanted to ask you, what was your mother's family?

Lin: Oh, my mother's family was Guo family. The Guo family was also a big family, particularly in Fujian, and they are very comparable to our family, well educated and so forth. In fact, my father and some of his brothers all married from the Guo family, see. So the Guo family were among the very highly educated of Fujian. Some of their people did serve in the government, in high positions, secretary to the president or something like that.

They were all apparently not particularly rich, because in China at that time, we did not see--perhaps our family was taught so but others also--we did not see wealth a good thing. I mentioned it, I can say that in the whole country, in China at that time, there was no regular law, or law that could be generally used. So there were two ways for people to get rich. One was being a corrupt official; the other, a merchant. The merchant often has to be corrupt because he has to bribe officials. So the whole system operates on getting rich through corruption. They did not consider that as pure corruption because that's just the way things were. That's how the Chinese never developed into a legal system, even now. I think the Chinese government has a big problem. They have cured some of that, but a lot of it is still very rotten because of the old system. So they think if you're rich, you're either a corrupt merchant or a corrupt official. [chuckles] So often they would remain very poor.

We were so poor that every festival in China, like the moon festival or new year, there would be several shop owners or sellers waiting in our front door steps, waiting for my father to pay them off. Because my father never had money to pay them for a few months, they accumulated maybe fifty, a hundred dollars, so they sit there and wait to get paid. My father had to be paid by the government. If the government has no money to pay regularly every month, at a festival day my father would wait in the government office until the afternoon, say five o'clock, he brought back some money, and pay these people off. So, we were not paid that well, but we were okay, we can survive, but nothing presumptuous.

Now at home, I was taught all these classics in Chinese literature until about 1924. I was about twelve years old.

Swent: You wrote with a brush?

Lin: Oh yes! Yes, yes, yes. I can write better with a brush. Brush yields more artistic penmanship than these sharp pens we have today. So I sign my name with a soft pen, it looks very good, T.Y. Lin. [shows a paper with signature, laughs]

Swent: I noticed.

The Boxer Indemnity and Tsing Hua University

Lin: Now, let's see. My brother already in school, and later admitted to Tsing Hua University. Several of my uncles and cousins were educated through Tsing Hua, which was established by the Boxer Indemnity Fund. About three uncles and three cousins and brothers were all educated through Tsing Hua. They went through competitive exams. That means they were well educated to win the scholarship. So they were educated in Tsing Hua for a few years and sent to America for college and post-graduate studies.

Swent: This university was supported by restitution for the Boxer Rebellion?

Lin: Yes, yes. See, that established a good relation between China and America. America was a country that gave back their restitution to educated people. That created a lot of good will.

Swent: The Boxer Rebellion, though, was long before you were born.

Lin: Yes, the money was created after that.

Swent: The rebellion was in 1905?

Lin: Something like that. So my brother and cousins and uncles were educated at that time. Through this fund. One studied mining engineering, another studied architecture; my brother studied political science, et cetera.

Swent: I remember my father--my father was at Yale. He graduated in 1908, and he had a number of Chinese classmates in engineering, and they were supported by that fund.

Lin: Yes, they favor these high-name schools, you know: Harvard, MIT, Cornell, and so forth.

Swent: And they studied engineering and went back to China.

Lin: Yes, it's very difficult for them to study engineering in the USA. China is a different place. So they went back and got lost, but they did something; they did help. Anyway that was a very good move.

Swent: But Tsing Hua was--what was the connection then with Tsing Hua?

Lin: You see, the Boxer Indemnity Funds established Tsing Hua University. So Tsing Hua University is essentially supported by the fund. Whether totally or not, I don't know.

Swent: But they would study there first and then come here?

Lin: Yes, they study there for about three or four years, and then they were sent to the USA. There must be thousands of these people. See right now, Chinese Premier Zhu Rong Ji is a graduate from Tsing Hua, although he was not sent overseas to study. He is a very good, solid, hard-working premier.

Swent: And Tsing Hua still exists.

Lin: Still exists. But the new Tsing Hua has changed, is no longer supported by the fund. But it still carried on the tradition. It's a national university now. Now, where were we?

Chung Te Anglican High School, 1924

Swent: Now I think let's get you started to school at twelve. You had to start--

Lin: Nineteen twenty-four, okay. So, I never studied any mathematics at home, no English, but very good Chinese. Now I have to enter school, and the only school that's available for me to take the entrance exam, was known as the Chung Te High School, run by the British, I think it was the Anglican church. So I tried to take the exam. The only class that would take new students was third year of the middle school--as I said, there are six years of grammar school, six years of high school. That's the third year. Now I skipped all the eight years of previous education. That's the only way to go--but I was too young to be admitted. So we faked my age. [laughs] In China we have no birth certificates. So I just say we "faked" one year, so that I can take the exam. My official birthday became 1911, and November 14, according to lunar calendar. That is still my record with USA. But I knew actually I was born December 21, which is the lunar calendar of November 14, 1912, year of the Chinese Revolution. Anyway, so now I was born in 1911. Officially, in America, I was born in 1911. But it all started from my entering this Chung Te School. You have to be--whatever it was--twelve or thirteen years old to get in, and I was a year short. I said, okay, who knows--[laughs]--a year; that's China.

So I took the exam, and I had only a few weeks or at most two months to study. I think the important exams were at that time, Chinese, English, and mathematics. I don't think there was science at that time, so to get admitted--maybe there was some physics or something; probably not. So I took the exam with very short preparation, say no more than two months, and I was admitted. Among two students admitted, I was one.

Swent: Oh, my!

Lin: Yes, but I got in, with a faked age.

Swent: You had to learn English?

Lin: English, in a short time, but not much, good enough to pass by.

Swent: Did you have a tutor?

Lin: I think my brother helped me. His English was quite very good. He's six years older than me. He was in Tsing Hua at that time.

Swent: That's a lot to learn in a short time! Math and English both.

Lin: Now, the surprise is I didn't know, I was quite fast. Even at home, I had memorized those Chinese classics, in competition with my other cousins. Somehow I had good memories and memorized well. But later on, when I practiced engineering in this country, my partner--which we may talk about again--Ed Rice and I were many years, maybe a dozen years, together. People asked him, "How can you and T.Y. do so much work?" And he said, "You don't know how fast T.Y. thinks and acts." Then I begin to think that apparently I'm faster than others. And can do things in a hurry.

So anyway, with a few months preparation, I took the exam, and was one of the two admitted to the school. So I went to this Chung Te school, run by the Anglican church, went to church every morning. And the first semester--

Swent: Was this a boarding school?

Lin: No, it's not boarding. Every morning I went to school and came back home in the evening. But the first semester, a course, I flunked. The course was European History. I knew nothing about European history!

Swent: Of course not. [laughs]

Lin: They talked about Greek and Roman empires, all the religions and emperors of the West! I knew nothing! So I took the exam, and I flunked! That's after four months of schooling. That school has a rule, if you flunk the first semester, you can make it up the second one, if you are good. So second one, I did quite all right, so I passed. My Chinese was good, and English and Math. That's in this Chung Te British school.

Now, that year, 1925, either this year or just before, the so-called ["Wu Shang Chang An"?], May 30th incident, when the British massacred some Chinese students.

Swent: Was that in Beijing?

Lin: Beijing. Where exactly, I cannot remember. I think it's in Beijing, maybe somewhere else. Yes, I think it's in Beijing. So the students were mad about the British, so we quit the whole school. I don't know how many quit, maybe a great number. The school had maybe three hundred, maybe two hundred quit--[laughs]--quit British.

Hwei Wen American Methodist School, 1925

Lin: Quit that school, so I had to go to another school, and Chinese schools, I don't know if there were any good ones, or any at all. So I tried to enter the American school, which was one of the American Methodist missions. In 1925, I took the exam. There were only again, a few, that's admitted. And I had to take the admission test, to jump another year. I finished the ninth year, and jumped the tenth year. I took the exam to the eleventh year. Only a few elected; I did pass it. So I got into this school, with only one year in the British school.

Swent: What was the name of this school?

Lin: This is called Hwei Wen. Now both of these schools still exist in Beijing. In fact I went back to the Hwei Wen School, the American school, and donated [U.S.] $100,000 for a scholarship. It is still there now; that's about ten years ago. So they wanted to name a big laboratory building the T.Y. Lin Laboratory; they didn't do that, but they asked me to write a--how do you call this--a plaque for the whole building, signed by T.Y. Lin. Anyway, I contributed $100,000 at that time. One reason was, I got paid selling my firm and got paid something like half a million dollars U.S. So to cut down my tax--[laughs]--I gave $100,000 to that school.

Swent: A hundred thousand dollars!

Lin: A hundred thousand dollars, yes. So that school got the best of my donations besides UC Berkeley. That was my second high school. I think later--yes, I contributed another $20,000 or so to the first high school, where I studied one year.

Now in these two years I really learned a lot. I never studied chemistry, never studied biology, never studied mathematics. I had some English lessons from my brother, and my English was quite good. Chinese always good, no problem. Now when I entered this school, several teachers were American ladies. One was Miss Quick. The other was Miss Terrell. Anyway--several American teachers, they taught English, and I read such books as Charles Dickens's *David Copperfield*, Stevenson's *Treasure Island*, you know, and all these, in school. I learned a great deal. All these were new to me, all foreign. Now the problem is I never studied chemistry in those two years, and only studied one year of physics. And my wish at that time was to learn something that can save the country from all the foreign oppression and internal strife, so political science was my real wish in order to help China. In school, they had debates, in English and so forth. I was the youngest in my class, but I performed quite well. [laughs]

Let me see now, during this year, some problem happened in Beijing. Some student demonstration and then suppression, like Tiananmen, June 4, 1989. I did study mathematics, calculus, algebra, and so forth. So I was there two years, and I graduated with very high grades, maybe number one or number two, from the school. Now, after finishing that school--I had three years of public education in total--I was fourteen years old. Yes, fourteen years old. Young boy, huh?

Swent: Very young!

Lin: Very interesting. Now, you can ask any questions more about my high school.

Swent: Were there only boys in these schools?

Lin: Let me think. Yes, yes! I think in both cases there were only boys. I didn't realize it until you asked about it. Yes, very interesting.

Swent: Were there any sports, athletics?

Lin: Now, they had all kinds of athletics--that's one part I was very poor; I never had chance to do much, just study, you know. And I remember when I was young at home, I was so lazy that I was often spanked by my mother, at home. At school, I worked harder, but had very little time for sports.

Before entering school, when my father gave me something to read, to memorize, I played! I didn't do anything. [laughs]

Swent: Maybe you were so smart you didn't need to?

Lin: Well, I was spanked by my mother maybe four or five times, not hard, but--[laughs]. Everybody in my family thought I would do poorly in school; I was such a lazy person. Somehow after I got into the school, I became very serious, but neglected athletics. I took very little athletics. I played some tennis, some basketball, but not nearly enough. That's why I think I didn't grow much. Our son, Paul, now, is six foot, and I am only five feet, six inches.

##

Lin: Our daughter is five feet, six inches, and I am five feet six; and Margaret is five feet, two inches. So our grandson--my son has an American wife, which helped a lot--our grandson is six feet, two inches. He asks me, "Grandpa, how come Paul grows so high?" Because Margaret is five-two, and I'm five-six, and our son is six, but he is six-two. See? I think because of better food and exercise, and athletics.

Swent: That could be.

Lin: Because when we took Paul over here about five [years old]--[pause]. He grew up here fast. We went to Belgium for a year; he did not grow at all. The food was not as good as America. And after we came back, the growth shoot up so I concluded it must be exercise and food.

Swent: I wanted to ask another question, speaking of food--did you eat lunch at the school?

Lin: You mean in China?

Swent: Yes, when you went to the Chung Te and Hwei Wen schools.

Lin: Okay. We ate lunch at school, and there, they did not supply lunch. But we were given some allowance to buy our lunch. And lunch we had was very common Chinese food--jiao tse [pot stickers] or something like that, reasonable food, but limited. We had very little money. It's about as good, or not quite even as good as home. At home we ate reasonable Chinese food, but nothing really that nutritious: not enough meat, just rice. Now at school--I remember, in second one, Hwei Wen High School--we would pay so much--I don't know--three dollars, five dollars a month. The students manage themselves. The whole month we save money, but the food was terrible. There's this soup; the soup has just water, with some cabbage floating on top! Not nutritious at all. At the end of the month, they had some money left over, so served a whole course of six dishes of meat, very oily, and we all had stomach ache--[laughs]--these kids!

Swent: But you were getting Chinese food.

Lin: All Chinese food, but nothing nutritious, and no exercise. So I think it's all right when Paul came here--he exercised and got good food and grew up. Some of it was genetic, but most of the second generation here jumpd up, because of improvement in food, and they exercised. That's one thing my father remarked on my mother, "Your mother, her job is to have children and bring them up." So my father remarked one day, "Mother brought you kids up very well, intellectually and morally, but not athletically." [laughs] He put that blame on my mother. I don't know if my mother or not but the whole family emphasized so much on study, and very little on athletics anyway. That's China.

Swent: Well, you've done very well. [laughs]

Lin: Now, I finished my high school.

Swent: You were still only fourteen years old.

Lin: Still only fourteen. I was born in 1912, December, by the time I graduate in 1927, June, fourteen and a half years, in the American way. In Chinese way, sixteen years. Now, I had to take exams into college or university. Finally, I narrowed down my choice to two universities. One is Tsing Hua University, which has two or three thousand people at that time already, I think. There is Jiao Tong University, Tang Shan College. Now, I wanted to enter the Tsing Hua University to study political science, to save the country! My father said, "Engineering is better. It is a solid science, and you can earn money better after graduation." So I said, We'll try the other one, Jiao Tong University, which is well known for engineering. Tang Shan College, near Tientsin, very well known for civil engineering--and some mining. Mining is quite well known in that school.

Jiao Tong University, Tang Shan College, 1927-1931

Lin: So I took both of them. Tsing Hua University had about one or two thousand applicants. They took in maybe fifty, whatever. I was ranked number five--because my brother was there, and someone told him, Your brother was quite good--number five. But he said my mathematics was number one! Because there was a problem in algebra or whatever, which no one else can solve, and T.Y. Lin solved it.

Then, Tang Shan University limited the freshman year to only thirty students. The majority came from their prepatory school and they took in only a few, three or five students. So, here, they conducted exams on chemistry, physics, mathematics, English, Chinese. I did quite well in physics and mathematics, in Chinese, in English, but chemistry--I never had chemistry in school. So the last few one or two weeks, I took a book and read it. I got about 30 percent of a hundred. That's very poor, but the other exams were so good, so I was still taken in as the number one entrant.

Tang Shan University was some hundred kilometers from Tientsin. Now I had to choose between these two, Tang Shan and Tsing Hua. At my father's persuasion, I chose Tang Shan, which sort of guaranteed a job if I graduated. Because you see, ministry of railways ran the school, so I can work on the railways if I graduate; it's a safe thing to do. The other would turn me into political science and general studies. Also I felt in Tang Shan--in the exams--I was number one, in Tsing Hua I was number five; that's not number one, see. So I said, Okay, I'll go to Tang Shan. The funny thing is I was such a young kid, just fourteen.

Tang Shan is on the railway about, say, an hour or so from Tientsin. So I started from Beijing, bought a suitcase, took the railway to Tientsin, changed at the station, going to Tang Shan, which is a mining center, the Kai Long Mining center, mining coal. Kai Long Mining was a big mining company in north China at that time; now there are many bigger ones. Beijing to Tientsin, and from Tientsin turn a little bit. Probably east of Tientsin. Tientsin was a large city outside Beijing. But Tang Shan is a mining city outside Tientsin. So I went from Beijing to Tientsin, and transferred to Tang Shan.

Swent: Shan means mountain?

Lin: Shan means mountain. Tang Shan--yes--Tang Mountain. It's famous for its Kai Long Coal Mining Company.

In China, Tang Shan was not a well-known place, because it had only coal mining Now in about 1976, the big earthquake made it famous.

Swent: That's it! I knew I had heard of this for something--that was the earthquake!

Lin: The earthquake sort of leveled the whole city and the school.

Swent: That was about twenty-five years ago?

Lin: About. Tang Shan, it was a big earthquake. I don't know, fifty thousand people killed.

Swent: Nobody knows!

Lin: You see, because the houses were built in the old style--brick walls--and then the concrete slab; walls came down and slabs crushed the people to death. That's Tang Shan. I went back to see all the remains, but they moved the whole university now to Sichuan. First in O Mei--a mountainous place--and later on to Chengdu, which is a big inland center in Sichuan. The university now may have ten thousand or twenty thousand people. Big school now. When I was in Tang Shan, there were about three hundred students, the whole college. And now they have ten or twenty thousand. Total change. Yes. You see, China now has about--I'm guessing four million university students. When I graduated, it had, I'm sure, no more than forty thousand in total.

I think the total in my days was much less than forty thousand, and now it's four million. So it has grown a lot. But still, you compare it to America, I think we should be at least forty million, should be another ten or more times. So it's far from America, but it has changed a great deal. Okay, where was I now?

Swent: Now you're a little boy still off to Tang Shan to college.

Lin: Oh yes, going to Tang Shan. Now I remember, the first time I went there, got down from the railroad, about two o'clock in the morning.

Swent: Oh my!

Lin: Yes, yes. So carrying my stuff and walked. Walked, I believe I walked all the way, although I might have gotten a rickshaw part of the way, probably I walked all the way, from the station to the campus. It was not very far, but still--for a little boy.

So when I got to the school, they gave me the nickname of Xiao Lin, "Little Lin," because I was so small. My pictures show I'm that tall, and all the others were taller. [demonstrates with hands] I was fourteen; all the others at least eighteen, probably twenty. So they called me Xiao Lin. Now I learned to use a slide rule, square, or a triangle, or scale, everything, which was very Western to me.

The first year I think I did okay, learning all new things. Second year I did quite good. In fact starting the second year become quite a good student.

Swent: You must have been terribly homesick?

Lin: No--very interesting! The way I was brought up, even in the high schools, I stayed partly in the dormitory, so I was used to getting out.

Swent: You were staying in a dormitory at Tang Shan?

Lin: Tang Shan, yes. Four years all in the dormitory.

Swent: Did you have roommates?

Lin: Yes, yes. Very good ones. I think several of them also came from Fujian. One is still here in America. Others have died, and so forth.

Swent: You're still friends?

Lin: Still friends, still friends, yes.

Swent: That's wonderful.

Lin: Now, these college students were good friends, good friends.

Swent: I'm surprised that you were not terribly homesick; this was the first time away from your family.

Lin: It's very interesting, because I was never home-bound. Also I was not afraid. Always these people get homesick. Margaret would be, but I just never did. It's funny. Yes, you asked that question.

Now, after in Tang Shan for one year, I believe the next summer, Chiang Kai-shek was conquering China from the south, close to Tientsin. And his army was between Beijing, Tientsin, and Tang Shan, somewhere. So I was to go back home. So many were some homesick, they wanted to go home. Go home, I had to go through the front lines. But I took a train--here's Beijing, Tientsin, Tang Shan; there's the army, there's front lines. So I took a train to Tsin Huan Dao, and then a boat to Tientsin. Instead of crossing the front lines, I went in a roundabout way by boat.

I remember that year. I stayed with my uncle in Tientsin, for the summer. That's interesting. And then went back to Tang Shan.

Swent: What did you do in the summer when you were staying with your uncle?

Lin: Okay, just loafing. Just loaf around, back to a kid again, really do nothing, never study--when I didn't have to study, didn't study. At school I studied very hard, although sometimes I enjoyed the work. I studied a lot but I never really felt forced to study. If I don't like to, I just don't study. So that whole summer was wasted. Could have done something better.

After that, I went back to Tang Shan again. And since the first year, my grades were always very good. So in Tang Shan, I was number one or number two all the time.

Swent: Were there women students?

Lin: No.

Swent: Just men?

Lin: Again, just men, except, near the last year, that's 1931, '30 to '31, they begin to admit two or three girl students. And there was a fight among the boys to get these girl students. I was not interested--too young. They used all kinds of ways to chase the girls. One of them, I thought was unfair, although it had nothing to do with me. I led a group against him, just to maintain what I called justice, whatever; had a big fight in the school. Two of them got married, and now they are still in Beijing. We are good friends now, but at that time, I was against him for whatever reason; kids.

Now, for school, I learned all the Western sciences: calculus, mechanics; I began to take courses in chemistry, physics, and a lot of engineering: railroad engineering, bridge engineering, and so forth. Regular college courses, in engineering, supplemented by some literary studies. And I was good, because I did have a good literature background, at high school.

Swent: Who were your teachers?

Lin: Okay. My teachers were all Chinese, except the chemistry teacher. I think his name was Eaton. Professor Eaton taught me chemistry. He was the only one. The others were all Chinese. They were all educated in America. And most of them graduated from Rensselaer, Illinois, Cornell, maybe MIT, but not from Harvard--[chuckles]--and Yale, which were not engineering schools.

Swent: But they had Western education.

Sister Goes to Radcliffe College and Later Receives a Letter

Lin: They had Western education, in America. Whether through the Boxer Indemnity Fund or somewhere else. One story I should not omit is about my sister. My sister, also T.Y. Lin, she is still now living in this country, close to a hundred years old now, is in poor health. But she studied in Radcliffe, girls' college. And she returned after four years of Radcliffe, also with the Tsing Hua Indemnity Fund. She went back. That must be about 1923 or something.

Now there's a true story, that one day she received a letter, sent from her Radcliffe schoolmate. The envelope says "Miss T.Y. Lin, China." And she got it! [laughter]

Because there were not many Chinese people in America, and this one came from America, and the Chinese post office said that it must be this person. She lived in Beijing; now she is here. "Miss T.Y. Lin, China"--how can they send a letter so addressed--. [laughter]

Swent: That is amazing.

Lin: Chinese post offices were quite good. They were good. Workers had life-time jobs, and not very involved with the revolution. [laughs] Let me see what else I can say. [pause] Okay.

Swent: I'm trying to think of questions that I had. [pause] At Tang Shan, when you were studying there, did you have any contact with athletics there--did they have an athletic program?

Lin: They had. But I studied too much and they didn't require any. I did some, but not enough, I think.

Swent: And you were living in a dormitory.

Lin: In a dormitory. I had played some tennis, but not enough.

Swent: What about clothes? What kind of clothing did you wear?

Lin: Okay. I remember looking at my pictures. When I first got in there, I wore the Chinese long suit, whatever.

Swent: Robe?

Lin: Long robe, whatever, but later on, of course I changed to Western style.

Swent: Do you recall when you changed?

Lin: I think within that four years, probably gradually changed, maybe second to third, third to fourth year or something.

Swent: How did you feel about it?

Lin: At that time, I think I thought it was natural, because the world was changing, you see, so I changed myself.

Swent: It didn't bother you?

Lin: No, no. For whatever reason, I'm never against the West. I think Chinese should be westernized; for whatever reason I got that impression. But it was a very oriental country.

Swent: And yet you did take part in that rebellion at the college, at the first college.

Lin: At the first high school, yes. I marched with the students against the British, and also took part in the Sun Yat-sen's funeral. Yes, I think that was 1925, when I changed from one school to the other. Very anti-British because they had killed some students. [chuckles, sighs]

Meeting Margaret in Nanjing, 1930

Lin: Now, in the third year, 1930, our school arranged a trip for the next year's graduates, to South China. And we passed through Nanjing, and that's where I met Margaret.

How old was I now? Seventeen or eighteen; yes, seventeen. Margaret was something like twelve.

Swent: How did you meet her?

Lin: Yes, yes. Let me see. Now Nanjing was a new capital for China. Chiang Kai-shek moved the government to Nanjing. So my father and other judges of the Supreme Court, and her father was one. They were judges of the Supreme Court, first in Beijing, and now all moved to Nanjing. And the two judges and others shared a big compound, nice compound around a small lake, very nice, and separate houses. Separate houses--maybe four or five of them. So my father had one, and Margaret's father had another, see. So we met there. And for whatever reason, the first time I saw her, I said, That's the girl for me!

She was only twelve or eleven, see. I was seventeen. She was charming and very beautiful--you see her picture there, see that one right there [on the wall]?

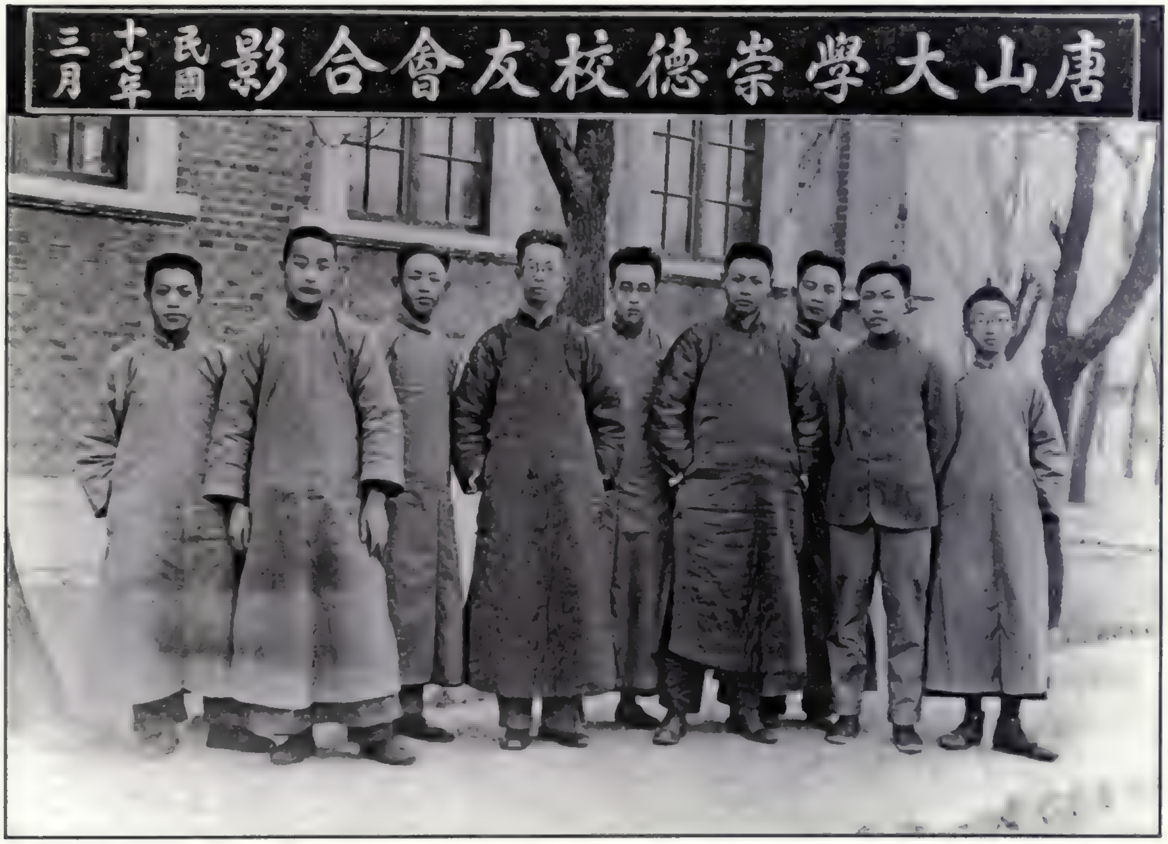
Swent: Yes!

Lin: Looks like a princess.

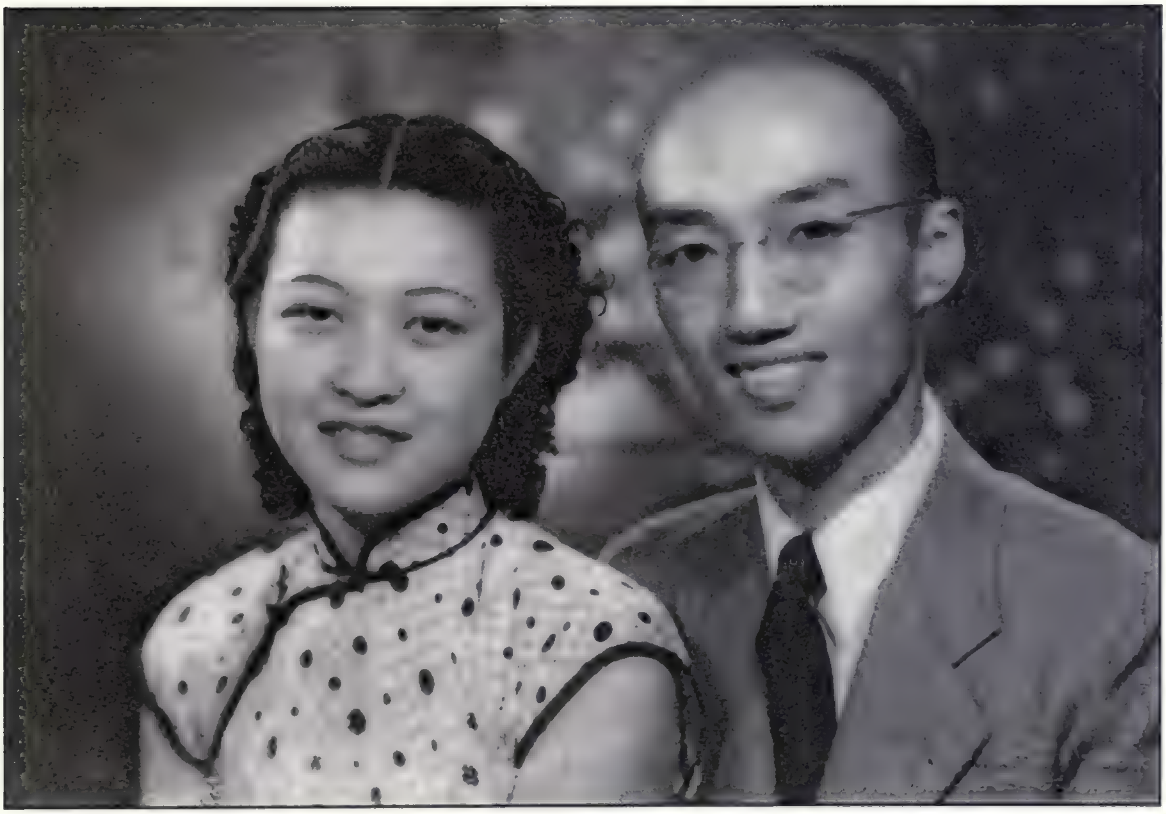
And this one was taken when we moved in here. That's thirty some years ago, she was already forty some. At that time she was twelve. Just a beautiful princess, very shy and very beautiful. I knew--that's the girl for me! [chuckles]

So I chased after her or expressed my love--she didn't understand. She didn't know at all. But that's how I met her. That started the whole thing. However, it must be this girl! I'll go to her!

So the year after, 1931, I graduated. I passed by Nanjing again, en route to America. I was eighteen by that time. I think she was something like twelve still, or thirteen. So, still, she didn't understand! See, very shy and all that. So I left for America.


唐山大學崇德校友會合影
民國十七年三月

T.Y. Lin, at far right, enters Tang Shan College, 1927.



Margaret Kao and T.Y. Lin become engaged, 1937.

Photo by William's Studio.

II THE UNIVERSITY OF CALIFORNIA, 1931-1933

Brother T.C. Lin, Ph.D. in Political Science, Instructor at University of California, Berkeley

Lin: In 1931, I came to America. Now, my brother, T.C. Lin, had a doctoral degree in political science from UC [University of California] Berkeley. And he was a teaching assistant or instructor at Berkeley. And he figured out that I should get foreign education, so I can help him to support my parents later. We were all thinking in those terms. So, I believe my father paid my fare over, which is about three hundred dollars, U.S. dollars.

Swent: By ship.

Lin: By ship. Japanese ship, Shinyo Maru or something. It stopped en route at Honolulu. There were no high-rise buildings at that time. Again a missionary there--through what connection, I cannot remember--took me to his house, which was two stories on top of a hill--it's a very nice place. And then, I came to this country in San Francisco, and through my brother's connections, introduced to UC Berkeley. That was 1931.

Swent: You lived here with your brother then?

Lin: Yes.

Swent: Didn't you tell me that you had a little trouble getting housing?

Lin: My brother and I, sometimes we tried to find housing. Once or twice, we saw a house for rent, and went and applied. And the lady said, "No, already rented." So apparently, that we were not welcome at that time. Just one or two such cases did happen. Then we did live on Panoramic Way. By that time I think there was some prejudice against Chinese, anyway.

Swent: On Panoramic Way?

Lin: Panoramic Way, very nice. Over, on top of the stadium.

Swent: You rented an apartment?

Lin: Yes, my brother rented an apartment.

Swent: It must have been a big change for you.

Lin: [pause] Yes! Yes! Somehow I took all these changes just like that. I don't know why. I took them for granted.

Swent: Very adaptable.

Lin: Apparently, very adaptable. There's a lot to say about after my coming to this country.

Swent: Did you write to Margaret?

Lin: Yes. I tried to write--she doesn't reply, or might have given me one or two brief replies. She didn't know I was trying to--[chuckles]--to court her. Yes, I think I have written some letters to her; not too many. Later she may have replied one or two. She didn't know what was happening.

Now, my two years here is a long story in itself.

Swent: Perhaps we should begin that next time. I think maybe this is a good time to stop. [Margaret Lin has come in]

Lin: Yes, that's fine with me. Then next time we'll start at UC Berkeley.

Swent: Is there any more that you would like to say now?

Lin: We might like to supplement on the years in China before coming here.

Swent: We can always add.

Lin: We can always do that. Especially I started in the old China, the agriculture and oriental country with no relation to the West--not much. And then--

Swent: How did your mother feel about your leaving to come to America?

Lin: Many people have come here before me. My uncles, my brother, my sister, all came here before me. It was a regular thing, not special. But still we were to take American education. That's very important

[He calls to his wife Margaret.] Ask her a question.

Swent: So he fell in love with you the minute he saw you!

Lin: Yes, yes.

Swent: That is quite a story.

M. Lin: I was in grammar school.

Lin: Yes, but her grammar school teachers were after her too. She is very shy, and beautiful, so the boys like that kind of girl. So when I came to America, did I write you some letters from here?

M. Lin: I don't remember. [laughs]

Lin: If I did, she didn't care. Maybe one or two letters. But I was so struck. I've got to marry this girl! Wonderful, just wonderful. But I fell in love because she's so beautiful, and so shy. Yes.

Swent: She's still beautiful, but maybe not so shy now.

Lin: Not so shy now.

M. Lin: Still shy.

Lin: Still shy, but a lot better now. [laughter]

Swent: Well, I think perhaps that's a good place to stop.

Lin: Yes, yes.

[Interview 2: June 29, 1999] ##

Swent: We're beginning the second interview now, and you said that you had a correction to make from last time about your family.

Lin: Yes, something minor but very important, and perhaps a major point, just one number. Last time, I said the Lin family started 500 B.C. I was thinking of Confucius around that time, now I look back, it was 1100 B.C.

That's the end of the Shang Dynasty and beginning of the Zhou Dynasty. So I was off by six hundred years.

Swent: That's a long, long family history, three thousand years--amazing! And we Americans brag about coming over on the Mayflower.

Lin: You can go back ten generations or twenty, that's the greatest, the most, I think.

Swent: And you go back hundreds of generations.

Lin: Yes. On the other hand, for the three thousand years, we have not changed much until the last hundred years--very interesting--whereas you have changed a lot since the French and American Revolutions, and the Industrial Revolution.

So, that's why Europe is ahead, because you were able to proceed ahead by about two or three centuries ahead of China. China has remained thirty, forty centuries before that without much change--[laughs].

Swent: And you've lived in the period of its enormous change.

Lin: I really lived in the period of three thousand years! Beginning when totally an agricultural country, with some culture, yes, but nothing such as science or industry, as we now have it. As of these last few years, the communication revolution is even more horrible and our lives have quite changed. One of our granddaughters, she just got married, and the couple work at their home. So, each work with a computer, communicating many miles away, but none of them has to go there!

They work from home, see. It's very interesting. I heard of this possibility at least ten or twenty years ago. Now, it's come to our family--[chuckles].

It touches us in a way. And I am working here, and doing some of my office work in engineering in San Francisco. I just faxed over a while ago and somebody will fax it back to me, and we got finished early!

Swent: Yes. I think the fax has been particularly revolutionary in engineering--you can fax drawings and--

Lin: Could you do that on e-mail? Quick too?

Swent: No, I don't think so. I understand that the fax has been especially useful with Chinese also.

Lin: Yes! I thought the Chinese language was terrible without the alphabet, but now, it's not that bad.

Swent: You can fax it.

Lin: You can fax. So that's how things can change. So the Chinese language has been given a real push, as a result of modern science. [chuckles] We don't know where we should go from here.

So anyway, shall we go back to our business?

Swent: All right. We had just gotten you to Berkeley, and we stopped then; it seemed like a good stopping point. You were what, seventeen, eighteen years old?

Lin: Yes, I was eighteen years old. I came to Berkeley, as I said before, because my brother was here. He was already semi-established here at UC Berkeley.

Swent: I don't think we got your brother's name--

Lin: His name is T.C. by initials. I'm T.Y. He's T.C.

Swent: Is Tung a generational name?

Lin: T (or Tung) is a generational name. He's Tung Chi; I'm Tung Yen. He already got his doctoral degree in political science, at UC Berkeley. And he was an instructor in Chinese at Berkeley, at the university. So he has some money--few thousand dollars or whatever, earning maybe two or three hundred dollars a month, and that's a lot of money then.

Swent: It was the Depression.

Lin: The Depression. So as I mentioned, he wanted me to come over for my sake, for his sake, and also for our parents. He thought he would not be able to support our parents singly, so try to educate me to the point where I can make a little money, and help him support the parents. That's the kind of thinking people had at that time.

The Voyage to America Via Hawaii

Lin: To me, to go to America is a very great, very important thing, to learn the Western way of thinking, and science and industry, and so forth. My father thought so too. So I think my father financed my trip--maybe with some help from my brother, maybe not --which I believe cost maybe something like two hundred dollars. So I took a Japanese ship--I think Shinyo Maru or something. It took me some twenty-five days to go across the ocean.

Swent: You mentioned that you stopped in Honolulu.

Lin: Stopped in Honolulu. I was very impressed by Honolulu, which is nothing like it is now. The tallest building was, perhaps, two or three stories, maybe at most four, I don't know. I went on top of one of the hills, where some Christian father, I think, hosted me there. I looked out over the ocean, and saw something of Honolulu, without all the buildings we now have.

Then I came here, and was received by my brother, and lived in his apartment. First I had to get admission to UC Berkeley. And Berkeley at that time had not heard of my college. They knew Tsing Hua, perhaps Yenching, but not Tang Shan.

My university was known as Tang Shan College. Tang Shan is the place that was devastated by the big earthquake--1976. Probably something like that. And then, my college belonged to a bigger university, called Jiao Tong University, University of Communications, paid by the Ministry of Communications and Railroads. Tang Shan College of Jiao Tung University.

When I came here to Berkeley, people said they had never heard of this! Neither Jiao Tung nor Tang Shan. So we can not let you in to our graduate school. We don't know how good your undergraduate training was!

Studies in the Senior Class in Civil Engineering

Lin: Okay. Then, they decided to put me into the senior class of the college of engineering, civil engineering department at Berkeley, which, in fact, turned out to be very good for me. Because at that time, the third and forth years of the college were very good schooling. The graduate school was not that good anyway.

Swent: They had a very small graduate school.

Lin: So I had several serious courses.

Swent: Who were some of your teachers?

Lin: Okay, the most well-known was the dean of the college. Dean Derleth, Dean Charles Derleth, Jr. He was very well known as a civil engineer, and also a bridge engineer. He was chief consulting engineer for the old Carquinez Bridge. He often talked about how he erected the whole bridge in one piece. Then, he was on the board of consultants for the Golden Gate Bridge and the Bay Bridge, so he was very involved in bridges.

Swent: And they were both under construction at that time?

Lin: Both were being designed, when I came. And both started construction when I was leaving, 1933. So in that period, I learned a great deal about--indirectly--about bridge design and bridge construction, much of this from Dean Derleth.

The next professor was Professor Bruce Jameyson. He was also a county engineer, for Alameda [County], and designed bridges in Alameda--including the Posey Tube, leading from Oakland to Alameda. Anyway, so I learned from these two teachers, among others, very good bridge engineering from those two.

Anyway, I said I was admitted as a senior undergraduate student, so I took all these courses, including sanitary engineering, and even railroad engineering. I came to study railroad engineering. There was a Professor Foote, very well-known in that branch of engineering. But, what's railroad engineering in America at that time? It's out of date already. But still, I took some courses.

Swent: It was out of date, you said.

Lin: It was out of date--nobody built railroad anymore in this country, even at that time. There was this professor who was very good in it.

People were building bridges, yes. So I learned more about bridges. So I entered as an undergraduate student for a year, and did very well, one reason being that the courses I already took in China, not as advanced, but pretty close.

Swent: There was not too much difference?

Lin: Not too much difference. Except this input of the two professors about their practice engineering. Of course in China there was also, because China, there was this professor, Mao Yi Sheng, who was very well known. He was the number-one bridge engineer in China. He didn't really teach me, but he was the president of the college while I was a student there, and [I was] influenced by that into bridge engineering. Here I met these two other professors, Derleth and Jameyson. So I was attracted to that field.

The Japanese Invasion of Manchuria

Lin: Now, living with my brother--he was paid maybe, I don't know, one, two, three hundred dollars a month; he was doing all right. Then, two things hit me. First, the Japanese invaded Manchuria that year. I think it was September, 1931, when I just came here. And the Japanese claimed that they would get rid of Communists in China, so they had to invade China, to avoid the Chinese becoming Communists. That's their propaganda in this country. From what I knew, many of Americans believed that, too. So, let the Japanese clean out the Communists. Actually, they were cleaning out Chiang Kai-shek, who was a Nationalist, who was anti-Communist, but who was getting so strong--having conquered, unified, almost all of China. Japan thought it better move now before too late. They moved to get rid of Chiang Kai-shek. But they claimed--this shows how Americans can be fooled--they can clear out the Communists.

Anyway, when Japan invaded Manchuria, I was very moved. When I was young, I was taught how to save the country, and now the country was being taken by Japan. They occupied all of Manchuria. That's a very important area, the most rich area in China, anyway.

Man Chu Kuo--they established Man Chu Kuo, and put the old Ching Dynasty emperor, the last emperor, to be in charge. That's a very interesting story, a long story, by itself--

Swent: What was your source of news here when you were here at that time? How were you getting news?

Lin: Yes. American newspapers. Occasionally, there's a Chinese newspaper, published in Chinatown, by the Chiang Kai-shek government. So we occasionally would get these, but most of the times, American papers. American papers paid great attention to this Japanese, quote and unquote, "Invasion of Manchuria." And they only reported the news from Japan--also from China. But it is clear that the Japanese invaded and took the whole Manchurian country in a short time, because Japan was so superior in cannons and warfare compared to the Chiang Kai-shek people. And Chiang Kai-shek, at that time, has not unified Manchuria. There was a local warlord, Chang Hsueh Liang, whose father Chang Tso-lin was assassinated by the Japanese.

The Great Depression and Bank Failures

Lin: So, I was very moved by that. Nothing can do--I was only a student. The second thing that hit me the most was--it just happened to be the height of the depression. After I came here a few months, my brother, one morning, told me: "You know, T.Y., our bank has closed." Failed. He had about two or three thousand in that bank. That's quite a bit at that time.

That bank paid higher interest than usual, maybe 5 percent higher. And one day, the bank closed!

Swent: Oh my!

Lin: Among all the other banks. I didn't know there was a depression. I think the depression started in 1929. The bank closing mostly started in 1931, just the year I came here. So my brother said, "Well, now, I cannot support you anymore. You have to get ways of how to support yourself." So I applied to the Chinese government, and the Ministry of Communications gave me a scholarship, something like fifty dollars a month, and that's a lot.

Swent: Now you had to apply back in China?

Lin: Back in China.

Swent: Or was there a consulate in San Francisco?

Lin: There was also a consulate in San Francisco, yes. We know several of the consulate people and so forth. But we applied back in China and got it after a few months. That was a big help.

But that was not enough. So, I still had to make some money. I tried several ways of making money. One was--I had a classmate in America, whose father owns a small contracting company. He took me to his home, and let me chop timber, form work for concrete, wasted material that the contractors hauled back to his home.

Swent: Waste material?

Lin: It was waste material of timber concrete forms. I chopped the whole day, and I was not that strong at all.

My good friend told me, T.Y., you're not very good in chopping timber. Otherwise we could have paid you, maybe, two dollars, but he can only pay me one dollar.

Swent: Oh my!

Lin: At that time, it's still a lot of money. So I got one dollar, and said, that's not my line of business, [chuckles] couldn't do a good job.

Then, next thing I tried was to work as the busboy or something. I don't know--didn't succeed at all, no one would take me. In fact, no one did take me. Then I saw the papers, there was an advertisement. A group of American students, four of them, living in an apartment, wanted help, and a cook! So I presented myself. I said, "Yes!" They said, "Ah, good, Chinese, you're probably a good cook--you look good!" So I worked, helped clean the house, and cooked for them.

Swent: Did you know anything about cooking?

Lin: Never! The first dish I cooked, and cooked wrongly, was the fried eggs. The eggs when fried [turned] black, I didn't know how to fry eggs! The students were very nice. After a week or two, they said, "Lin, you're not a very good cook." [laughter] They thought I was.

Swent: Yes. All the Chinese are supposed to be good cooks--[laughs].

Lin: So, I lost the job. Then, I said, "How can I earn a living?"

Professor Bruce Jameyson Arranges a Tutoring Job

Lin: I went to my teacher, Professor Jameyson. He said, "You know, you should teach!" I didn't know I could teach. What happened was, just about that time there were four students in my class who wanted to prepare for the final exam in structural engineering. And I gave a private tutoring to the four. So we went into one of the classrooms, the engineering building, which is still there now in campus. Very large classroom, taught those four students, explained to them how to prepare for the final exam. You know what I did? I gathered the past ten or twenty years of all the problems Professor Derleth and Jameyson had given to their students. And somewhere I gathered them into a list of maybe forty or fifty questions. I explained how to answer these questions, to those four students.

Now, one day, Professor Jameyson passed outside my classroom. I talked so loud to four students--I was known from then on as a loud--[chuckles]--loud speaker. When he held his next class, he asked me, "How many you have in your class, Lin?" I said four. "I thought you had forty!"

I didn't realize--I was a kid, eighteen, not quite nineteen year old at that time. The four students all passed the final exam very well. Because actually they knew what kind of questions might be mostly out of forty or fifty questions, which I had explained to them. And that [tutoring] gave me a very good pay! So next semester, there I went to the professor and said, "How can I earn a living?" "Yes, you can be a teacher! I'll speak for you."

So he announced in class, that I will organize a make-up class for students. My! That time, I think there were thirty or forty students; I think I gave a six-hour tutoring to the class, and charged, per person, per hour, one dollar or something. So I made two or three hundred dollars. That's a lot of money. The students were very impressed this time.

Then came, the following semester. And I continued this tutoring business, and I commissioned one of my classmates to collect money for me and manage it. He was very nice in managing. I think the next time I must have, [pause] fifty, sixty, seventy people. And either that time, or the following semester, two or three students came from Stanford, to listen to my lecture!

Swent: Well!

Lin: They said, "This Lin, very good." I was then about nineteen or twenty. They came. The interesting thing was, my friend--I cannot remember his name--he collected all the money for me and managed for me, I should have paid him, but I didn't know that American practice. In China, as your friend, you always work for nothing--[chuckles]--which is sort of crazy, but that's China.

Swent: Was he an American?

Lin: He was an American. So I never paid him, and the last ten or twenty dollars, he took away himself. I never saw him again. And I thought that's, not that good. I should have paid him thirty or forty dollars, whatever--I didn't know the practice, see--. But we still remain unknown friends. That means the kind of things that I have to learn here--difference in culture, in practice. Nevertheless, I became a very well-known lecturer. And did quite well, I think.

Advancing Direct Moment Distribution for Professor Charles Derleth

Lin: Now the other part I had was, how I learned from these two professors I just talked about. Professor Derleth was the consultant on the Bay Bridge and Golden Gate Bridge. So one day in class, he talked about the Golden Gate Bridge towers. So tall, four hundred feet, seven hundred feet, depending where you measured from. Very difficult to design for it. Nobody knew how to design it at that time. By then, I started initiating a new idea, which I called direct moment distribution--[drinks tea]. How to distribute moment in a steel or concrete frame.

Now, this whole thing was started by a professor at Illinois, known as Hardy Cross, very famous professor, nationally, internationally known, because he initiated the idea of moment distribution.

Swent: I see. So it wasn't something that you began?

Lin: No, no. But I advanced it one step. His method of moment distribution was to assume all the joints of a frame are fixed and move them, see. Shifting the movement back and forth, through a series of iterations, until you get an answer. And that's very well known. Otherwise, we engineers have no idea how to analyze a frame. Now, the Golden Gate Bridge is a frame, a quite complicated frame. His method is called the moment distribution and made him very well known, as I said.

He came to Berkeley and gave a talk here once. I was a student, I sat in. He was not a very good speaker, but excellent in this matter of engineering analysis. I took the method and advanced it one step, called direct moment distribution. The word direct means, I loosen the joint just once and got the answer, instead of moving back and forth, twisting the joints back and forth maybe ten times. I would release it once and get the answer. So I call it direct moment distribution.

Now, this actually might have started from another practicing engineer, by the name of Russell, in San Francisco. He was a friend of Jameyson's. Later, I had his paper, he was writing about initiating such an idea. And the bad thing was, again, I didn't know the custom. So after I published my paper, I forgot to mention his name. Later he complained to my--

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Lin: --professor. My professor told me; I learned a lesson. That's not too late. Later I did acknowledge him. But I didn't know the practice--

Swent: That's another one of those cultural things.

Lin: Cultural thing. I never knew. In fact what happens now in China, many things I transfered back to China, the Shanghai Bridge, which we will talk later, they designed just like my proposal without giving me any credit.

Swent: In fact that's one of the big topics right now in all this information exchange that the Chinese--we call it pirating; they don't consider it pirating.

Lin: Yes, that's right. That applied to me when I did that myself.

Swent: It's just a difference in attitude.

Lin: Yes. So this matter of direct moment distribution: I derived two very important formulas, which enabled this process to be carried out. This was my work, which started from Mr. Russell and Professor Jameyson.

Anyway, I wrote this thesis under the direction of Professor Jameyson. This is in the archives, I think at our library.

Swent: Yes.

Lin: It must have been 1933.

Swent: Very important.

The First Student Thesis Published by the American Society of Civil Engineers

Lin: Very important. But more important, later, this was published in the American Society of Civil Engineers, first as the part of their Proceedings, and then as a part of their transactions. Anyway, it was published by the American Society of Civil Engineers. And never in history has a student thesis been published in this prestigious publication.

That made me very famous; now, also very controversial. Because the old professor Hardy Cross's students, including one, Dean Grant of Florida University, very well-known engineer. So there was about ten or fifteen well-known engineers and theoreticians put in--what do you call them--discussions on my paper. And those were all published. Of those, one was Professor Egor Popov, who is now still a professor emeritus at Berkeley. Grant and Popov always wrote discussions on my paper, so that made my paper better known. And also the Portland Cement Association, who is the organization of cement producers, and they published pamplets, quoting my method in their pamphlets.

And my method is known throughout the whole country. Many schools, good schools, used my method to teach, and called that the Lin's Method of Moment Distribution, or Lin's Method of Direct Moment Distribution. Even now this is known, but it's mostly replaced by computers. So this is the part of the story. Now--

Swent: When you wrote this paper, physically, how did you write it? Did you type?

Lin: Type.

Swent: You had learned to use the typewriter.

Lin: Yes, yes. I learned a little typewriting; I type even very poorly now, but I do it and correct it.

Swent: But you did the typing. And did you have illustrations, drawings?

Lin: Oh yes, yes. They were drawn by myself. I don't [know] where the originals are, and I think the library has a copy of my paper.

Swent: I was wondering how you went about submitting the paper.

Lin: That's very interesting. Now, after graduating, I went back to China, by way of New York, London, and Paris. In New York, I went to the office of a top bridge engineer at that time, called Dr. Waddell, very well known. He must be about seventy years old at that time, so I went to present myself to him. He took me to lunch, on Wall Street. And I told him, I submitted a thesis to the American Society of Civil Engineers for possible publication. He said, "Fellow, they never publish a paper written by young fellow like you." He was right; that's true. But I submitted it. After one or two years, when I was back in China, one day I got a notice. The paper was published. [drinks tea]

Swent: [laughs] So it was published after you had returned--

Lin: To China, but submitted while I was here, finished my master's degree. I had the thesis and submitted it to the Society.

Swent: Did Jameyson recommend that you submit it? Or did he help you submit it?

Lin: Now, whether he helped me submit it or not, I cannot remember, but he actually directed my thesis. He was my professional guide for the thesis. Later, I submitted it. But he was really the originator of this thesis. I submitted it without any hope that it would ever be published. But after two years, I got published! Hah!

Swent: Wonderful!

Lin: And that is one thing I presented to Margaret--look at me, I have a paper published. So one way to court her--[laughter]. She by that time was something like fifteen or sixteen. She knew a little bit, but not much. But I was very proud. That's good, helping me to get a girl--[laughter].

Swent: Let's go back to Berkeley now. So you finished the year of undergraduate work, and then you did two years of graduate work to get your master's?

Lin: Pardon me, only one more year. Because the first year of all classes I had as undergraduate, then I did some courses with the graduate classes. So total, two-year stay at Berkeley, helped me to earn the degree of master.

Swent: And you were living with your brother all the time?

Lin: Yes. Now, living with my brother at that time, was essentially, helped by something like fifty dollars from the Ministry of Communications, and this extra money I made.

Swent: And your brother was employed at the university.

Lin: He was still employed, but his bank was closed. All the deposits he had was two or three thousand dollars in that bank, in one morning, gone!

Swent: That was terrible.

Lin: Yes, yes, but he was okay. He had his salary you know; he maintained himself all right, see. I was able to get by myself with fifty dollars plus the extra. The extra was very important, because at the end of the two years, I gave this make-up course to maybe about ninety students, so I made a total of something like five hundred dollars. So I took that money and paid my fare back to China with the trip through Europe.

Return to China via Europe; Photographing Many Bridges

Swent: You went by train from here to New York?

Lin: Okay, by Greyhound [bus]. I went by Greyhound and saw important cities, which were essentially Chicago and New York, and took pictures of all the main bridges in Chicago and New York. And then took a boat from New York--can't remember which it was--and all the way back to China, through Europe, maybe changed a boat in Europe. And stayed in Europe for two months, and then went back to China. By the time I arrived, it was December already.

Swent: Did you visit people you knew in Europe?

Lin: Yes, yes. It's very interesting.

Swent: Oh, let me go back a little bit, because I wanted to ask too, when you were here in Berkeley, who were your friends--of course you didn't have a lot of time--but was there a Chinese student group?

Lin: No, no other Chinese student. I was the only Chinese student, but I had several American students. They are very close friends of mine, for many years, see.

Swent: I was wondering if there was a Chinese community that would have helped you at all.

Lin: No, no. That's an interesting story to tell. On my way back to China, I had some money. I paid for the fare. In London, I carried some American money, which was suddenly depreciated at that time. And not enough to survive, so I needed more money. I was such a young fellow, twenty year old by that time, so I went to the--I don't know what organization--British organization for helping others, so I went in and asked to borrow some money. They refused. Why should they give to everybody? Then, I went to Germany and stayed with my Chinese friend, Mr. Liu. Two things impressed me. First, he lived on second or third floor of an apartment building. And one day, looking down the street, Hitler was marching! I think--I don't know if Hitler himself was there or not, but it was all those Heil Hitler. I did not know the significance of this march!

Swent: No.

Lin: But I saw it was there from the second floor. Germany was becoming Nazi at that time. That's one thing.

Swent: Yes, 1933, that was the beginning of it.

Lin: [Drinks tea] About--

Swent: What was your friend doing?

Lin: About September or October, about that time. My friend was a student there. And I believe now looking back--someone told me he was a Communist member, but I had no idea.

Swent: How did you know he was in Germany? Had you been in touch?

Lin: Must have been corresponding with him. He was my classmate, or a class behind me, in Tang Shan. I knew he was in Germany. I prearranged to stay in his place for one, two, three weeks, whatever.

Swent: Maybe I'm over-working this point, but communication at that time was by?

Lin: Letter.

Swent: Letter only?

Lin: Letter only.

Swent: No airmail?

Lin: No.

Swent: Slow letters.

Lin: Very slow. Very slow, see. So we knew he was there. He had been there for a year or whatever. So I stayed with him. More than that, he loaned me some money.

Swent: How nice!

Lin: Maybe fifty dollars or whatever. So we got along quite well. I stayed in Germany for two or three weeks, learned a little bit of German, didn't realize that Hitler was rising. But I took pictures of all the bridges in Berlin, and also Paris, and these were eventually published in China, with the bridges in Chicago, New York, Berlin, Paris, and so forth.

Swent: What kind of camera were you using?

Lin: Oh, very poor, very old-fashioned camera--[drinks tea]--black and white, small camera. I still have these pictures published in the Chinese journal about bridges from the world!

Then, let me go back to my study at Berkeley. I mentioned I worked with Professor Jameyson on my thesis, on his bridge, a bascule bridge over the Alameda river--what's that river?

Swent: The Estuary?

Lin: Estuary. I think that bascule bridge was still there when I came in 1950s. I don't if it's still there now. Could have been removed. But anyway--

Swent: It may still be there.

Lin: So that much I learned from Professor Jameyson, and I did make a study of the bridge and several drawings with calculations, which I still have somewhere, I think. I could have given it to the library.

Swent: That was a steel bridge.

Lin: Steel bridge. So it can be moved easily, you see.

Swent: Draw bridge?

Lin: It is a bascule bridge. Draw bridge--it's not draw, it's a rotating bridge. [drinks tea] So I made quite a study of that bridge.

Now, the interesting thing happened at Berkeley, which was Dean Derleth on the Golden Gate Bridge we just talked about. So I worked out this direct method of moment distribution--which made me very famous later. Now, when I conceived that, to a certain point, I talked to Dean Derleth. And he said, "Now, you are a consultant on the Golden Gate Bridge." I was either twenty or nineteen years old at that time. I had a better method to compute it, that tower! See, because using my direct moment distribution, that would have been very easy, you see. Because you just release it once and you get the answers.

Swent: I'm sorry, I couldn't get that.

Lin: It's just release the joints once.

Swent: Release the joints.

Lin: With the Hardy Cross method, which is better known, which was initiated ahead of me, we need to go back and forth, maybe ten times, every joint, until we get answers. They did not use Hardy Cross method and they've never heard of my method at the time. They used the old method, at that time, which was simultaneous equations. You get all these joints, each joint form three simultaneous equations to get forty-two simultaneous equations for the study of this Golden Gate Bridge towers.

So my dean, Dean Derleth--"Young fellow, come to my office." So I went to his office. Then, they separated on each table there. There on these work tables were three piles of calculations, each about two foot high. "So look at this!" So I looked. Every pile was one solution of the forty-two simultaneous equations. One pile was made in San Francisco; the second one in Chicago; the third one in New York. They hired something like fifty engineers to work on the solution of these forty-two simultaneous equations, for something like six months. Finally they got the answers. And they compared the three sets, to check, to make sure it was correct.

It's very clumsy! Using my method they could have done it in two weeks! But, look here, they have done it! You know. There's no reason to use my method again--they have done it, in an old-fashioned, clumsy way, but they did it! Now, I begin to feel why they did it. One was of course is to solve the problem. The other was to keep the unemployed employed--[chuckles]--see. I had no idea at that time--[growls]. They needed to hire those fifty engineers in three cities. It's very clumsy. Besides that, there was no other way to do it. Now, with a computer, it would take no more than three minutes.

Swent: Three minutes!

Lin: The whole thing took them six months, forty-five engineers, you know. My method could be much faster, but not compared to a computer, see. Anyway, after I looked at these three piles, I had nothing to say. So the dean said, "You have anything to say?" I said my method would have been better. "Aaargh, okay." He liked me a lot.

You know I heard this, later, from Professor Horonjeff of Berkeley. So Horonjeff was a professor here, and after I came back the second time, he told me--he told others too--Dean Derleth told him that "young Lin was the keenest student I've had in my forty years of teaching." [drinks tea] I've never thought of myself that high--[chuckles]--there were so many bright students there. But to his experience, apparently, that young fellow was very keen. In fact, he knew that the young fellow was very bright. Anyway, that's the story, so the story goes.

Oh, another story. Somehow, I never saw myself as being bright. And again, in connection with entrance into Berkeley, when I applied for graduate student, they admitted me, to be undergraduate. But the professor who examined me--what's his name--was Japanese, Kuno, professor of Japanese at Berkeley. He was also very smart. He told my brother. He said, "T.C., I thought you were smart, but your brother is more."

Because at home, we always said our brother was number one, and I didn't think I was smart at all. But out in Berkeley here, this remark from Kuno, and later from Horonjeff, raised my ego--[laughs].

Swent: Yes!

Lin: Maybe T.Y. is not so bad! Anyway, these are stories. I never thought of myself as being smart, although I was, certain ways seemed to be smarter, in memorizing poems and classics and this kind of thing. Otherwise, I didn't know I was very good, and getting in to school, I got in without trouble. I never thought of this as because I was smart, it was just natural. Now I begin to have some ego--[chuckles]--hearing from these professors. Now, what else from Berkeley here?

Swent: What did you eat?

Lin: Okay. Now my--yes, I remember now. Staying with my brother most of the time, we two cooked--I cooked more than he did, because he was teaching. I think I cooked for myself, and also had help from my brother when he cooked. Outside, the best place we did go to was Spenger's, Spenger's Seafood, which is sold now.

Swent: Just sold.

Lin: I understand they're going to open in September--I hoped they will open. At that time, it was about a hundred year old. So, it must be a hundred fifty year old now, something like that. But that, we cannot always afford that. Occasionally, we went to Chinese restaurants. At Berkeley, I remember one at University and Shattuck--I don't think it's there any more, anyway. And then, Chinatown, we would go over once every few weeks.

Swent: San Francisco.

Lin: San Francisco. Now, to go to San Francisco, we had to cross the bay. There was no bridge. So we took ferries. I remember we went on the ferries, took how long--thirty minutes. And then, every time when we came back, we smuggled a small bottle of whiskey. It was prohibition time. Nobody could buy whiskey easily. But in Chinatown we got them. It's a flat box--it's easy to put in a pocket and bring it back, and we got good food in Chinatown.

Swent: Was there a Chinatown in Oakland that you visited then? It was there.

Lin: It was there, but not as good as San Francisco. So we did not go there often, but it must have been there, I cannot remember that. Hmm!

Swent: Was the whiskey for yourself? The whiskey that you brought?

Lin: Yes, for ourselves! We didn't drink that much, just a little bit, on and off, Chinese friends, see, and American friends too. We smuggled. And this was considered normal.

Now, let's see what happened. Now, Roosevelt was elected, end of 1932. I knew nothing of it! I didn't know the significance of Roosevelt being elected. But later on, I began to learn about him and respected him very much. But as a student, I was only a student, deep in the studies of engineering, knew nothing about the society, or the politics, or economics, or financing in America even though I was deeply affected by the Depression.

Swent: Did you listen to the radio?

Lin: Let me think. I think there was a radio. We did not listen to it that often.

The only thing I paid attention to was the Japanese occupation of Manchuria in 1931, that continued for several years.

Swent: Did you go to any movies?

Lin: Occasionally, yes. Didn't have much time to go, but did see the movies. Yes, yes. But movies I really saw was when we got back to the U.S. the second time. Did I tell you, Margaret and I went to the movies--in one year, we saw over two hundred movies. [laughter]

Swent: As a student, you wouldn't have time to do that.

Lin: Now, I studied German at that time, for whatever reason, I don't know. Studied German here at Berkeley. German was okay.

Swent: In those days, scientists did learn German.

Lin: Probably, probably for that reason. Now I remember, I studied German for at least two terms, maybe more. The second term, came final exam time, I forgot about it! I don't know how. But that's how I am. I forgot to attend the final exam! At about twelve o'clock, suddenly, occurred to me--wow, the exam was almost over.

So I rushed to the place, to the room, and saw the professor. He was quite kind, let me retake it this afternoon, alone. So I took it alone, and passed it. He said you should have gotten an A but I'm going to give you a B because you were late. [laughter]

Swent: Did you give any thought to continuing for a doctorate?

Lin: Okay. The reason I never thought of this were two reasons. One was at that time, a doctoral engineering was not that frequent and not that necessary. The other I thought, if I got a doctor and go back to look at my young girl friend, Margaret, she wouldn't take me, I thought. How she would marry an old doctor? So better not get one. So I went back without it, partly because of that reason.

Swent: [chuckles]

Lin: It's funny.

Swent: Did you meet any girls here?

Lin: Oh--occasionally, yes--I think, there's one. I took her to a Chinese dinner, that's about all, I think. My brother did marry an American later.

Swent: A Chinese girl?

Lin: No, an American girl. My brother was here something like ten or twelve years.

Swent: Did he go back to China also?

Lin: Yes. He went back to China; his wife went to China. It was after ten or twenty years they were separated, and so forth. They never had a kid.

Swent: But you went back very soon.

Lin: I went back in two years. I got to rush back too, to Margaret!

Swent: [laughs]

Lin: It is funny, you know. There's something here that's unique.

Swent: Yes. And it has lasted wonderfully well!

Lin: Yes, yes, yes. Nowadays, I don't know if I would do it all over again, but maybe I would, you know. And I never thought of these things as being unusual. Everything I did I thought was usual, just that way. But I think the publication of my thesis, of the so-called Direct Moment Distribution Method, was known later as the Lin's Method. That's quite well-known at that time, about all academics and students in engineering knew Lin's Method. Can you imagine, I formulated that method at the age of twenty.

Swent: Wonderful!

Lin: Very interesting. Let me see, what else I remember--there must be a lot to say.

Swent: There must have been a graduation ceremony? Did that mean anything to you?

Lin: I cannot remember that particular occasion.

Designing the San Francisco Bay and Golden Gate Bridges

Lin: Now, there was an opening ground-breaking ceremony for the Bay Bridge and the Golden Gate Bridge. The two bridges were ground-breaking at the same time. I think some time in May of 1933. And, so our dean took us there. I went to the parade, to the parade of the ground-breaking ceremony, of both the Golden Gate and the Bay Bridge. And I took a great deal of interest and a small part, in the study of those bridges. For example, the Bay Bridge was made in model in our laboratory at Berkeley, see. It's a big model, I think something like sixty feet long.

Swent: What was the model made of?

Lin: Okay. I think it's made of essentially metal, probably steel. Not concrete. But the purpose of the model was to study the wind effect. What would happen to the Bay Bridge if the wind blows hard. The conductor of that study--I cannot remember his name. I should remember, anyway.

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Lin: So the question was brought up. The Bay Bridge on the western half has several suspension spans, and one big pier in between. One side of the pier has a suspension bridge, and the other one has another suspension bridge. The two were anchored by this heavy pier. They tried to study whether they could get rid of that tower. Don't build that tower, make the whole thing a continuous suspension bridge, and a model was made, to study that. The conclusion was: they needed it. And I remember--the professor was very famous--he told me, that they need this pier to stabilize the bridge against the wind. When you get this anchor here, you divide it into two suspension bridges separately, and we know that was safe.

Anyway, that's what he told me when I was here. I was inquisitive, asking these questions. But now looking back, I do not think that's the real reason--wind resistance could have been provided some other way. But, I don't think they knew how to build this continuous a bridge without that anchor. How many cables? One, two, three, catenaries, continuous all over, and the whole thing could be unstable during construction. They didn't have the knowledge how to build it. Even now, we have not done it, but we might. I think the main reason that they needed the center anchor was to help build the bridge. But to the professor, the important issue was the wind, and live load. What we call live load meaning automobiles or railroad trains. Dead load means the weight of the bridge itself. So these are the little things I learned from the great engineers at that time, at Berkeley.

Swent: Let me ask you something. I interviewed another man, who became a metallurgist, who was studying at Berkeley at about that time, but he told me--I remember--that he was taking a class in civil engineering, and he wanted, very much--he had been driving by the Carquinez Bridge when it was being built--and he wanted very much to cut class and go to the opening of that bridge. And this professor told him that if he cut this class, to observe that bridge, that he would flunk him. And he told me this story as an example that his teacher was interested in the classroom but he would not allow students to go out and look at the actual bridge! Now, you are telling me something that sounds quite different, that the teachers wanted to observe the actual--

Lin: Yes, yes, most of the teachers involved us in those things, in the outside world, as well as the theory, but this teacher, who said that, must be a sort of old-fashioned teacher. They emphasize so much on it--you miss the class, you miss something! To see that bridge under construction, so what! [mumbles] I'm sure it's not these two professors who taught me.

Swent: I don't remember that he even gave the name--

Lin: But he's way before that. That Carquinez Bridge was built nineteen twenty something.

Swent: I think it was the Carquinez Bridge he was talking about. This gentleman graduated in 1931. And you could tell that he was still hurt about it; it still made him feel bad.

Lin: Maybe for some other reason--maybe, it could be the dean told him. You see, the dean was in charge of this--he would have loved to have people watch it. So he was the chief engineer. He signed the Carquinez Bridge drawings, and when this center span--several hundred feet long was lifted up, from the water.

Swent: And that's a real draw bridge?

Lin: No. It's imagined to be constructed the draw bridge way. It's a fixed bridge. But that main center span was floated on, and then lifted up.

Swent: I see.

Lin: And that trick, I used in several of my later bridges, which we will talk about. It's very interesting. Yes, Dean Derleth was very proud. He arranged the lifting of this bridge. [pause]

Swent: So it was floated off and then lifted up.

Lin: Lifted. He looped the rope over and put on counterweights to move it up. There are several ways to do it. This is a very smart way that he worked out.

Hmmm, who could be that professor? That time is probably 1927, when this man you talk about was in the class. I think that's the year the first Carquinez Bridge was built.

Then, they built the second bridge, which is the same as the first--almost. At that time, I proposed to the CalTrans [California Department of Transportation] to build a cable-stayed bridge. And they wanted to build one just like the old one. That's very typical because they think it looks better. But later on they remarked, "We should have taken your scheme at that time--built a new one, it would have been better." Anyway. Let me think any more about my student work. [pause]

Let's talk about the American Society of Civil Engineering. When I was a student here, I was a student member. Later on, I was formalized as a junior member, after graduating. And in the capacity of this junior member, I got this paper published.

Swent: Have you continued your affiliation with the ASCE?

Lin: Yes. After the junior member, I was elected to associate member. After that--how many years--elected to full member. After that I was elected as a life member. After that, I was elected as an honorary member. That's the highest they have. I know not many people are like that, starting from student, to junior, to associate, to member, to life member, to honorary member.

Swent: Very few do that.

Lin: I am still an honorary member. Yes.

Swent: Did you go to their meetings, when you were here at this time?

Lin: I think I must have. Because the Society of Civil Engineers is quite active. They probably will have one meeting or the other--I must have attended some, but nothing in particular. But I've presented numerous papers and won several ASCE awards.

Swent: What kind of clothes did you wear in those days?

Lin: In America?

Swent: Yes.

Lin: Well, regular.

Swent: What were students wearing in those days?

Lin: Ah--okay. I think, I remember the kind of trousers, was in yellow color, made as sturdy as possible.

Swent: Made of cotton, or wool?

Lin: Probably cotton. Yes. How do they call them--not formal.

Swent: Not corduroy?

Lin: Probably.

Swent: It's completely different from what they wear now--I know that, but--. How did you manage your laundry?

Lin: Okay. I think, there was a laundry at that time. No? Oh, I probably sent it to the Chinese laundry, maybe there were laundromats already.

Swent: I don't think so.

Lin: Then probably sent to the Chinese laundry. We didn't wash ourselves.

Swent: No. What kind of shoes?

Lin: Same. [pause] Same as this, regular shoes.

Swent: Leather.

Lin: Leather shoes.

Swent: Yes. This is before Nikes.

Lin: Yes, yes.

Swent: Students' clothing has changed a great deal since then.

Lin: Yes.

Swent: Did you wear ties and jackets?

Lin: Not normally, but we have quite a number of American friends, because of my brother, who lived here a long time already, you see, we went to their home. And generally, I think we put on some ties at the dinners, but ordinarily, not.

Swent: And in Berkeley, there were streetcars at that time?

Lin: Yes.

Swent: And you mentioned the ferry.

Lin: There were streetcars. [pause] Oh my brother one day bought an automobile.

Swent: Oh, did he!

Lin: Yes, it was during the Depression, or a little after. I think he bought a Dodge--used Dodge--for something like six hundred dollars.

Swent: Yes. How did he learn how to drive?

Lin: Yes, took lessons. I learned to drive although seldom I did, but I learned to drive. We lived on Panoramic Way--my brother and I--that's near the university, so most of the time, I walked. [pause] Yes, and another time we lived on Oxford Street--near Oxford and Virginia, some kind of apartment. That's when we got an automobile. My brother had a used car--used Dodge--that's very prestigious--[laughs]. Let me see, what else now. [pause]

Swent: You were writing letters to your father, I suppose?

Lin: Yes, yes. Maybe once in a month or whatever, quite often. Yes.

Swent: You couldn't just pick up the telephone in those days.

Lin: No, no. It's quite an affair to communicate.

Swent: Yes. You were really on your own, when you were here, weren't you?

Lin: Yes.

Swent: You had to be very independent.

Lin: Yes, yes. So my son--two days ago he was here--and he said, his son--our grandson--is very independent. He makes up his own mind, learns his own way. And I said, so were you, so was I. We're all independent, see.

Swent: [chuckles] A long tradition of independence.

Lin: Yes, yes. But really, in the Chinese family history, people are not that independent.

Swent: No.

Lin: So I was very independent. Our grandson is very independent. He finished his Princeton work now. Thinking about getting into Berkeley to study, but has not made up his mind.

Swent: What is he studying?

Lin: Up to now, civil engineering. He has a very good mathematical brain. So his Bachelor's thesis was a very good one about wind analysis, and he is conferred with a National Science Foundation scholarship. So he can go anywhere with this scholarship. Now he is working in San Francisco, for two years, before he goes back to school.

Swent: In your office?

Lin: Not my office, another office. Professor Gerwick--you've heard of that name?

Swent: Oh, yes.

Lin: He's working in Gerwick's office. Yes. He will work two years. Next year, I hope he'll go back. He says he might want to teach. So he may have to get a doctoral degree; without that, you can't teach. But I did teach without a doctoral degree, you know. But that's once upon a time. Now, if you apply, no, nobody wants you, without a doctoral degree.

Swent: Those degrees are more important all the time.

Lin: Yes, yes.

Swent: Although they may not mean that much.

Lin: May not mean that much. Actual practice, may be more important. But, in order to teach, you have got to have that.

Swent: Yes. But you were teaching very effectively, with just a bachelor's degree.

Lin: Yes, yes.

Swent: Well, shall we move on then to the next stage?

Lin: Okay.

Swent: So you traveled through Europe for several months, and then you went back home to Margaret, and to your family?

Lin: Yes--[laughs].

Swent: This was the end of 1933?

Lin: End of 1933. When I took a boat from Germany--probably Hamburg or somewhere, and went through the Red Sea, back to Shanghai.

Swent: Through the Suez Canal.

Lin: Through the Suez Canal, yes. Bypassed India, and arriving in Shanghai. Now--

Swent: That must have been very exciting?

Lin: Sort of interesting, see. I took this trip essentially from the money I've made by giving classes at Berkeley. As I said, the last quarter, I made about five hundred dollars. That's a lot of money, then I was going to go back with it. But the money went fast. By the time, before I arrived Shanghai, I've spent all the money, not even one dollar left. I remember, I had a haircut a few days before arrival, but no money to pay for that. So I went to Shanghai, immediately, I called up my sister, who lived in Shanghai--that's my eldest sister--and she gave me ten dollars or whatever. I went back to the ship and paid him, the barber, with tips and so forth. So it's settled. See, so I went to China, worked, worked, nothing. That's very typical. The first time I went to America with nothing, and came back here again with nothing.

Swent: But you had a lot in your head.

Lin: I learned a lot! And later I will tell you the second time I came to America, again on borrowed passage. I came with no money, nothing at all. That's the second time. We'll get that later.

III RETURN TO CHINA, 1933-1945

A Traffic Engineer, Briefly, with the Beijing-Shanghai Railroad

Lin: But now, arrived in Shanghai, ready to go back to work, end of 1933. So my father was in Nanjing, with Chiang Kai-shek's government. He was one of the chief justices. So was Margaret's father, another chief justice. Hopefully, I will get a job from the Ministry of Railways since they financed the university I went to in China. The Ministry of Communications paid me fifty dollars a month while I was in America and sort of promised me a job. So I went back there, the Nanjing government, just settling down, in Nanjing. And they knew that I was a returned student--that's regarded highly, returned from America. There should be no problem getting a job. So I went to the government, to the ministry, and reported my arrival. [pause] For whatever reason, the managers were not that careful, and they supposed I graduated in Transportation Management. This is all transportation, with railroad, and I was an engineer! So they put me into a railroad, the Beijing-Shanghai Railroad, to practice as a traffic engineer--railroad traffic. And I was stuck there for a while, half year or one year.

Swent: Did you learn anything?

Lin: That's the interesting thing--I did learn a lot. When I was stuck there, I did not learn much about engineering, but about traffic. I did something quite interesting about traffic, whatever, from an engineer's point of view, so I helped my bosses. My bosses generally liked me a lot, and I helped them how to estimate maintenance as well as construction. For about half year to one year, I learned that traffic engineering.

Engineer with the Ministry of Railways in Nanjing

Lin: Finally, they moved me correctly to the Engineering Department of Ministry of Railways in Nanjing, so I worked with the ministry. That's fine with me because my little girl was in Nanjing, so I wanted be near her, try to chase her to express my love for her and so forth--she didn't understand--[chuckles].

I lived then in my father's "condo"--he rented a "condo," not far from the ministry. So I lived there, and ate there for free, and lived there for free, and got my salary, from the Nanjing Ministry. I had some very good bosses, who happened to be designer of bridges. So I learned the way to design a number of bridges--standard steel bridges--for the whole country, which they could order later from America. At that time China cannot make those bridges; they generally ordered them from foreign countries, and shipped them back to China. Now of course they make--

Swent: That is the steel they ordered. They would order the steel components, or the entire bridge?

Lin: Entire bridge--assembled in components. See, from foreign countries, and they assembled it in China.

Because they cannot fabricate the steel, at that time. But very soon, they were able to fabricate the steel. At that time, I did this kind, designing the standards, which later, I used in certain railways in China. So I worked in Nanjing for about two or three years, designing these--what we call standard steel bridges, see.

Swent: Was this because China was expanding its railroad system at that time?

Lin: Yes, yes. I did not, at that time, understand how the Chinese got the money. Apparently, most of these foreign materials were ordered with foreign money--foreign loans--French, British, what not. I didn't know these details; I did the drawings. But later on looking back, China did not make these. Later, I had one chance to assemble those parts in Hong Kong, that's several years later, maybe we'll come to that when we get to it.

At that time I worked in the Ministry of Railways, just designing, making drawings, and setting up standards, which was a quite important thing, but I had the knowledge--I learned these at school, particularly here, at Berkeley, and also in China. So I set up these standards, together with other engineers.

Swent: What kind of standards?

Lin: Okay. Take steel bridges. Some bridges are girders. So girders of this height, this length, this size would fit this location, so made a set of standard, see. Because in China, there were not many engineers, but there were many railroads to be built. So the easier way is to set up standards. They would look at this bridge, and say okay, this needs a sixty-foot bridge, steel girder of two feet high, whatever, and you've got it. They just use the set of drawings, and fit these designs there using those as standards. That was, apparently, the old practice. When the Germans and French built some railways in China, they used most of the Chinese engineers and some French or British engineers, and they cannot do everything in great detail--so we set up those standards. And the Chinese later on--we copied the same ideas to carry on, so as to be able to design a number of bridges with a set of standards.

Swent: I see. But each bridge is unique.

Lin: Each bridge is unique, but you have a standard to fit it, you see. For example, say steel girders--steel beams--ten feet, twenty feet, forty, or a hundred feet. The details of each girder has already been worked out.

That's how we did at that time. Let me see, what else happened in--while this was going on. Oh, Japan's invasion of China--the Japanese preparing for more invasion, from Manchuria, expanding into North China and South China, and that was already started at that time. The Japanese first occupied Manchuria, but they are ready to move down, see. And we knew when the Japanese declared to eventually conquer all of China.

So after Chiang Kai-shek was in Nanjing for a few years--I would think no more than seven or eight years--that was a very peaceful time in Nanjing. And my father was paid regular salary, which was, maybe five hundred dollars, a lot. The Chiang Kai-shek government was able to pay regularly, unlike the warlords government in Beijing, which would never pay regularly. Now in Nanjing, they would get regular payment. And I also got paid too --something like one hundred twenty dollars a month, a returned student would get one hundred twenty dollars. A native graduate may get only sixty or eighty dollars. So I got one hundred twenty dollars. In fact, I should have been paid one hundred sixty dollars. For whatever reason, they fumbled and put me on a lower class--one hundred twenty dollars--that's not bad; I lived in my father's place. [pause]

Okay, so I was in Nanjing from 1934 to 1936 or 1937.

Swent: I was trying to remember when the Japanese invaded Nanjing. That was--

Lin: After. The so-called "massacre." That was in 1938 or 1939.

Swent: Were you still there at that time?

Lin: No, we will get to that very soon.

Swent: So in 1936, it was still okay.

Lin: Yes. Nineteen thirty-four I was in Nanjing, 1935, 1936, just about 1936, words of Japanese possible invasion of China--of coming down from the north and so forth.

Swent: But you were still comfortable there.

Lin: I was still there, but I had the opportunity of working with some very well-known Chinese bridge engineers of these old days. Mao Yi Sheng was one that I mentioned, and others, doing some bridge work here and there.

Moving to Chongqing to Escape the Japanese, 1937

Lin: By 1937, I think, it's evident that the Japanese are going to try to conquer all of China. So, I consulted with my father, that I should move into interior of China, so the Japanese would not be able to--

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Swent: You thought that you should move into the interior of China, so that the Japanese wouldn't take you.

Lin: Yes, yes. At that time, my boss, Mr. Deng, was named the chief engineer, in charge of Chongqing-Chengdu Railway. That's in the Sichuan Province, up the Yangtze River, near the top of the Yangtze River. We thought the Japanese would never be able to get in through the Three Gorges--there they would fight hand to hand, see. So I decided to move, to follow one of my bosses, Mr. Deng, into Sichuan. I was very young, I was something like--how old was I? Nineteen twenty-seven; I was about twenty-four or twenty-five, 1937. So I moved up to Chongqing.

Not soon after I moved in, Chiang Kai-shek was captured by some pro-Communist people, and imprisoned, in Xian--have you heard of the Xian Incident, when Chiang Kai-shek was imprisoned?

Swent: Yes.

Lin: That year I think was 1937 or 1938. When I heard of that--oh, I cried! Such a good leader! How they got him?! The Japanese fought China because of Chiang Kai-shek. Chiang Kai-shek almost unified the country. Japan said, if we did not conquer China now, we never will. So Japan sent out a big army to fight. They sent an army from Manchuria, into Beijing. So that become the Lu Gou Chiao Affair, when the Japanese first invaded near Beijing--Lu Gou Chiao [In English, Marco Polo Bridge] [In Chinese, asking Margaret:] Which year did Lu Gou Chiao happen?

M. Lin: Lu Gou Chiao?

Lin: Probably 1937, when the Japanese started invading Beijing.

Swent: There was an incident at a bridge.

Lin: Yes, "chiao" means bridge--Lu Gou Bridge, or the Marco Polo Bridge.

Swent: Yes, that's what it was called in English.

Lin: Yes, yes. It started there. I was already in Chongqing.

Section Engineer for the Difficult Chongqing-Chengdu Railroad

Swent: You had already gone to Chongqing.

Lin: Yes, heard the news--Aaargh--but kept on building the railroad. First I was named as section engineer, in charge of a section. Next to Chongqing, which was the most difficult--say, twenty kilometers--section, most difficult of the whole railroad. It alone has five tunnels, and maybe fifty bridges, small and big. So they say that T.Y. Lin is a good engineer; give him the most difficult section. As I said, I was about twenty-five years old. So I was in charge of this whole section. I remember the surveying of this was all through very steep hillsides, almost ninety degrees vertical. I had to climb all these sharp hillsides along the Yangtze River--the section is along the Yangtze River. Very rocky.

Swent: What were you doing? Were you actually surveying?

Lin: Surveying, actually surveying. I was in charge of the section, so I did the surveying myself, with help, of course. With help, and then designed the whole section. Again, generally, with the standard bridges to fit in. That's not very difficult.

Swent: What sort of surveying methods were you using then? A transit?

Lin: Yes. I used the regular instruments--transits, levels--we learned at school.

Swent: Were these in common use in China at that time?

Lin: Oh yes. These things, they bought from America. But they are in very common use along the railroads. It's not easy to survey along these cliffs! And to locate these tunnels and bridges, and to put them--

Swent: This was a completely new road-bed? There had not been anything--

Lin: Nothing at all!

Swent: No horse trails or anything?

Lin: No horse trails--now, hiker's trails.

Swent: Foot trails?

Lin: Foot trail, maybe one or two feet wide, very difficult trails, not even continuous--but there were trails for people, not for horse.

Swent: But there had not been wagon roads or anything like that?

Lin: Now I remember the five tunnels were considered to be quite difficult, because we had not done any of these before. So we bought rock drills from Ingersoll-Rand Company--have you heard of it?

Swent: Oh, yes.

Lin: Yes, Ingersoll-Rand Company. So there were five of those, Ingersoll-Rand Company drills--each tunnel had one air compressor, with drills. Now, these drills arrived from the river. The railroad bed is about a hundred fifty feet, maybe--at least a hundred and twenty feet--above the water. The reason is, the difference in high water and low water, is in the order of a hundred feet, at that stretch of the Yangtze River. The high water is there, low water is down here. The difference is about a hundred feet.

So my railroad had to go on top of that high water. Ordinarily I would get low water, so we worked very high above the water. But as a young fellow, that's nothing to me--to climb there all the time and survey and locate the railroad, first from the map, then took photos of the area, and located railroad lines, and put them on the ground. And then, drill those tunnels and build those bridges.

Swent: What about safety considerations? Were there any accidents?

Lin: Good question. No. Very little considering that, because people workers, their lives were supposed to be cheap, you see. I remember once, when we put dynamite in one tunnel, and the dynamite shoot the rock, out of that hole, into the opposite hill, and killed one person there.

Swent: Oh!

Lin: But it was just too bad. Yes!

Swent: Did you wear any safety gear at all? Hard hats or--

Lin: [pause] Probably I had hard hat, but not necessarily all the time--[chuckles]. I remember the opposite hill was about three or four--several hundred feet away, a man was shot by the rock from the tunnel--horizontally over.

Swent: What about the people that were doing the drilling, did they have protection from the dust?

Lin: Okay, that's a good question. They probably have some protection, to what degree--I don't know. Now, these were all laborers, recruited locally or elsewhere in China. In China, there were those railway-working gangs--maybe five hundred miles away--they were recruited and sent over to this railroad, under construction.

Swent: It wasn't only the Californians that recruited the Chinese railroad workers--[chuckles].

Lin: Yes, yes--[chuckles]--quite so. And the organization of those workers was extremely interesting. They were organized in gangs, and each gang would have one or two chiefs. The chiefs would order or command these and take them several hundred miles away to work. They may have experience, may not. But people were treated nothing like what you do to workers in this country. First, the people who lived on the hillside, they were forced to leave, without payment. The government didn't have to pay. Some of them may get paid; most of them didn't get paid. I don't know how they moved. I didn't care; I was used to that--we needed the land, we needed that right of way, and we brought in the laborers, and worked on those tunnels and bridges.

So we drove the five tunnels, some quite long--maybe a thousand feet, two thousand feet, others quite short. And then built those high bridges. It's a very difficult job. As I said, the difference between high and low water is a hundred feet, so the bridge is at least a hundred feet, going up from below.

So I was able to put in what I learned here, as a student in Berkeley, the so-called rigid frame bridges. They were starting to take place, to develop in America at the same time; I used it their way. These were the few bridges I did design, in particular, but most of the other bridges, I used the standard sets, which others and myself had already prepared.

Swent: Were these bridges across the Yangtze, or were they across tributaries of the Yangtze?

Lin: They were across the tributaries; none were really across the Yangtze; we stuck to one side of the Yangtze River.

Swent: So these were just crossing little side canyons.

Lin: Little side canyons, side ravines, canyons. They were, however, quite high--a hundred feet high; length maybe no more than a few hundred feet each--not a very long one, but on cliffs! I have a whole book of these things here--that's very interesting.

So I've been working on these. Now the job of getting the Ingersoll-Rand compressors from the water up to this hundred feet height: it's a difficult job, I don't know how to handle it, but, the Chinese foremen, who had experience, and they assigned one of those to me. He knew--he used ropes, and whatever winches were there. He raised them all the way from the water up--not big machines, but ropes and winches. They had people who had done such work, now, under my direction, and eventually produced compressive air.

Swent: What was powering the winches--people or motors?

Lin: Winches were operated by people, without power. They used people power, but they can do this, Chinese laborers. I could not do it, but my foreman could do it. I remember these compressors were taken from the river up to the top.

Swent: They came on boats up there, barges up there? And then human power winched--

Lin: Winched up.

Swent: Amazing.

Lin: And then they used this dynamite--I think it was dynamite, not black powder. Ah, we had dynamite--we also used black power, but we used dynamite, too. In fact, I completed under my direction--although I did not have much strength myself, my foreman managed all these--finished the five tunnels, and much of the bridges; not all. That took about a year or two.

Swent: Could you guess how many people were working on this?

Lin: In my section, I think on the order of two thousand.

Swent: My! All men?

Lin: All men--no women at all, no. All men, and as I said, they come in gangs, you see. One leader would have fifty, a hundred people. And there were dozens of these gangs.

Swent: And were they living in camps?

Lin: Camps, in camps. Very poor living conditions, but apparently, these moving laborers were happy to get a job like that.

Swent: Yes.

Lin: They got some food to eat, and paid a dollar a day, whatever. They were able to do these things. Some of them experienced, and teaching the others. Eventually, all the two thousand were pretty good. They built these things--they built the bridges and built the tunnels--with very little modern equipment, although they had compressors and so forth.

Swent: Those drills were--I suppose, what we call a jackleg drill--the kind that one person could operate?

Lin: Oh yes, one person could handle a drill. As I said, I have a whole book of these pictures--very interesting. I left it at the office, anyway.

Swent: And you were living at that time in Chongqing?

Lin: No, I lived along the section, about twenty kilometers from Chongqing, see. Occasionally, I would go to Chongqing for a visit and so forth. But, essentially, I was able to finish that--half-finish that line, with these bridges and tunnels and cuts--the cuts were so steep, maybe fifty-feet cut, from almost a vertical cliff, and they were all done!

Swent: Is it there still?

Lin: Still there! Now, in fact, I had a chance to go back and look at it twice. Once about fifteen years ago--about when I was going back to China--they put us on the train and looked through the whole thing. And the whole thing was essentially there--they made some minor modifications, but the bridges and tunnels were there.

Recently, I understand, the section I worked on was so hard, we had to make the railroad crooked--to go around very sharp curves. Now, these were not up to the modern standard. You see, the hill is very rugged, so the line has to turn sharply around, to fit into the land, you see.

Swent: Yes.

Lin: Under that condition, this was built. Now, not long ago--maybe five or ten years ago--I heard, they have straightened it out. With longer tunnels and smoother curves, I heard. They can do that now. That's already done. So part of that may not be there any more.

Swent: And this is way above the flooding--this won't be inundated--

Lin: All above flooding, see, as I said.

Swent: I meant the new dam they are putting in will not--

Lin: Will not, the new dam is below that, below that. Much below, much below, will not affect it, much below it.

Swent: Tremendous.

Lin: Tremendous. You hope how a person has that courage--if I do that again, cannot do it, but at that time, it's nothing!

Swent: Yes.

Criticizing the Design for the Neijiang Bridge

Lin: Now, after having somewhat finished that section--which is the toughest section--I went to Chongqing again, for the tenth time or whatever, into the head office. My bosses, Mr. Deng, and Mr. Chen, and others, called me in, into the head office, and they showed me their design of a big bridge across a big branch of the Yangtze--not Yangtze itself--they call it Neijiang Bridge. That bridge is about two thousand feet long, whatever, over a main branch of the Yangtze River, between Chongqing and Chengdu--not in my section. They were very proud they designed this bridge. They said, "Young Lin [they called me 'Xiao Lin,' 'Small Lin'], look at our bridge."

I looked it over, in about fifteen minutes, and everything looked wrong! You made the wrong design! Ah! I told them --they were very good engineers. They were trained in the American Bridge Company, got doctoral degrees, but they see only the little things, cannot see the big things. I said, first of all, you design what we call a deck bridge, meaning all the steel is below the bridge. This was like much of our Bay Bridge here.

There is another type called the through bridge where the rails go through the steel. So that's called a through bridge, like the high cantilever--span of the Bay Bridge.

They used deck bridge. Now I said, to go up to your deck, you need a high approach, a high fill, to fill dirt all the way until get to that high. That's a waste! How can you fill all the approaches with that much dirt? They didn't look at it. They care only about the bridge!

They didn't look at the approach fills. I said, first of all, this should not be a deck bridge, in order to save all that earth fill you now put in. I think it should be a through bridge. The bridge should be lower, the steel should be above the deck, so the railroad would go down here and did not have to climb up that high. That saves millions and millions of dollars.

That was one thing wrong. The second thing, they learned the structural design of the bridge, and said that it should have to be different span lengths for different portions of the bridge. Near the ends, the piers would get closer together. Near the center it would be wider apart, just like our Bay Bridge here. I said, that's not necessary. Under low water level, a narrower river appeared, and they were tempted to bridge over with one span. But under normal water, it became a wide crossing, so I would suggest making all the spans the same, maybe seven spans, about three hundred feet apiece. And that would be easier to fabricate. We can order these similar spans from America or Europe at lower cost. Note that the river bottom is more or less flat, and not dipped in the center.

So they say, [angrily] "Young fellow, what do you know, get out!" Okay, so I got out. And they went into a huddle, the three of them--the director, the chief engineer, and the chief bridge engineer, for about over two hours. They called me back. They said, "'Little Lin,' 'Small Lin,' everything you said was right. Now, from tomorrow on, you would be the chief bridge engineer."

Chief Bridge Engineer for the Entire Railway at Twenty-Five

Lin: I took it. But can you imagine a twenty-five year old, to be chief bridge engineer all of a sudden. I should have felt unqualified or something, but I didn't--oh, okay--I took the job.

Swent: They had asked you for your opinion.

Lin: Yes, yes, so, I took it. But imagine these three older fellows. If I were in their positions--I wouldn't give the job to a young, twenty-five year old person just because of his remarks on this bridge. They had the nerve to assign it to me. I took the job and redesigned this Neijiang Bridge, see, to something like seven equal spans. Recently, about three years ago, Margaret and I went back to the site to see that old bridge. It was still there!

Swent: Still there!

Lin: And I looked at the steel truss, the arrangements of the rivets there look just like my drawings, which I made at the Ministry of Railways, standard steel truss bridges.

Later on, the Communists took over all of China, and the first railroad they accomplished was in 1951. I have a newspaper clipping to that effect, 1951, when they declared, the Communist Party completed its first railroad from Chengdu to Chongqing, and this bridge was there. When we went back about 1994 and looked at that bridge, it was still there.

Swent: But they claimed that they had been--

Lin: Now, in a way they were right. The steel trusses were built by them, but the design was made by me. I designed it, but there was no steel during the war. After the Communists took over, they had steel, whether homemade, or foreign, I don't know. They put on the steel, they finished the bridge, and indeed they did the whole railroad! That was the first railroad accomplished by the Communists. All the bridges were designed by me, and they knew that, and so they let me see when we were there, around 1994, to look at what I had done.

And we have some pictures of this bridge taken at that time--very interesting.

Swent: Still there.

Lin: I still marvel at my bosses, how they can apppoint me, twenty-five years old, to be chief bridge engineer!

And now I will tell you the story of what I did as a chief bridge engineer. There were about a total of a thousand bridges and culverts--culverts meaning small pipes--for the whole railway. I went along the whole railway, which was divided into seven districts, with a total length of some four hundred kilometers. I went through the whole length of the railway, together with the district engineers in charge. They would bring along already-made studies and drawings of every local bridge, big or small, with the land maps showing the draining areas. I would then, and right then and there decide this should be a thirty-feet bridge, steel bridge, ten feet high, whatever, and conceive the whole bridge, in one long sentence. They would record it. Every one of the thousand bridges were designed that way, and I specified where the piers should be, and what the superstructure should be, using the standard drawings.

The most difficult one was the Neijiang Bridge--big one, two thousand feet long, as you know. The others were small, small ones. But still, there were concrete arch bridges and steel girders. But none of the steel was available and therefore none was completed.

Only after the Communists took over, they completed with the steel supply. They built all the bridges, but essentially following my old drawings.

So sometimes I claim, I designed a thousand bridges, right there. After that, I designed a few hundred bridges, much bigger than these here, but they really had to be designed, while these thousand bridges took me about four months, to walk from one end of the railroad to the other, look at every creek, and say what it should be. Fabulous, you know.

Swent: You literally walked every--

Lin: Literally walked, all the way.

Swent: All of the way!

Lin: Walked through the seven districts.

[tape interruption]

Swent: You were just about to say more about the bridges through the seven districts.

Lin: Yes. I do not know if any other engineer had done that, designed all the bridges and culverts of the whole railroad in this manner, in a simple way, and very effective way. I think for big bridges you can not do that, but for those, none of them were too big. Except the Neijiang Bridge some two thousand feet long. It is still there. I still marvel at how those--my bosses--were able to have the courage to use me, and I had the courage to do it. But that happened; we just took it for granted. Maybe that was the only way of doing it at that time. [laughter]

Swent: I guess so. But were you able at that time to build any of the bridges?

Lin: Oh, yes. I would say maybe half the bridges were completed. They were strong, concrete bridges, as I said. We have pictures of all these. But the steel bridges were never built.

Swent: None of the steel ones; I see.

Lin: What time, maybe we should take a--

Swent: Yes, well, it's quarter to twelve.

Lin: Quarter to twelve!? Two hours gone already! Okay, we'd better stop. Oh, I didn't know--I thought--[laughter]

[Interview 3: August 3, 1999] ##
[El Cerrito, California]

Swent: We haven't interviewed for--it's over a month now, isn't it? You had been working for the railroad, and now I think we have come up to about 1939, and I wanted to read you something here and see how you reacted to it. This is a quotation from Jonathan Spence's book, [*Gate of Heavenly Peace*, p. 244] and he says, "In the early thirties, Chiang Kai-shek and the Kuomintang struck not only at the Communists, but also at the new generation of liberal, often Western-educated or Western-influenced students." I wondered, were you aware that there was a feeling against Western-educated [students], you were one of those students, obviously.

Lin: No, I think I was not struck with it, not opposed by Chiang Kai-shek. Why he wrote that--he must have some basis, but I was not aware.

Swent: Well, I'm sure he does, but I just wondered whether in your work as an engineer, did you find any resistance to the fact that you had been trained in the West?

Lin: No. Actually, they adore those who were returned students.

Swent: They welcomed it.

Lin: They welcomed it, yes. There may be some one or two cases I was not aware of.

Swent: But you were not bothered by it.

Lin: No. Interesting.

Swent: Okay. And then there's another little quote here that I thought I would like to know how you felt about it. Let's see, it was in 1937, I think, that Nanjing--when was the Marco Polo Bridge incident?

Lin: I think it's '37.

Swent: And then there was that terrible battle in Nanjing.

Lin: Yes.

Swent: And your family were still in Nanjing, were they?

Lin: No. We left just before that, maybe about that time. I got a telegram from my father in Nanjing, that the family was moving to Chongqing. He said I knew war is going to come, and then war did come. So our family, our whole family, got away before the Japanese occupied Nanjing.

Swent: Before that terrible time.

Lin: Before that, maybe a few months. And my father came into Chongqing, when Chongqing was declared the new capital of China. So the Supreme Court moved over there. I think that was the year 1937 or '38.

Swent: I think it was '37; and Margaret's family moved also?

Lin: No. I think my family moved sooner. And Margaret's family, for whatever reason, moved to Shanghai.

Swent: I see. Ooh, and that was--

Lin: Yes, from Nanjing to Shanghai, yes. They moved to Shanghai because she had uncles in Shanghai where the whole family could stay with the uncles' family. So they moved to Shanghai.

Swent: But that was sort of going from the frying pan into the fire, wasn't it?

Lin: Absolutely. They thought Shanghai would be safe, because of the British, French concessions, the Japanese wouldn't take it. You see? They thought, this was safe haven, so they went there.

My father came to Chongqing. At that time, I was asked whether I liked to go to somewhere near the front against the Japanese--after the Japanese invasion, up to near Wuhan. I volunteered to go, because I may have a chance to meet Margaret again. I thought if I'd go to Wuhan, I may go to Shanghai. So I volunteered to go to Wuhan, and left the railroad with the bridges half finished.

A Job Assembling Imported Steel Bridge Parts in Hong Kong

Lin: Then, when I arrived in Wuhan, a change was made that instead of getting me to Shanghai, they sent me to Hong Kong to do some bridge work in Hong Kong, where they had several shipments of steel bridge parts from, I believe, America, or perhaps England, I couldn't tell now. I was supposed to assemble those parts into a bridge with all the details, so they could use that bridge to build it in China.

Swent: Was the bridge to be at Wuhan?

Lin: No. I went to Wuhan, and then I was dispatched to Hong Kong to do this job of the steel parts for a bridge. The steel parts arrived in Hong Kong, so I had to put them together and so on and so forth.

Swent: Where was the bridge to be?

Lin: I can't even remember. I think it was along a railroad from Hong Kong to Wuhan somewhere. So I did very detailed work of putting a steel bridge together, counting the pieces, and so forth. So I stayed in Hong Kong for almost a year. Very unusual work, very technical. Fortunately, I had an elder sister. She and her husband Mr. Wu lived in Hong Kong, so I lived in their place for a whole year, assembling that bridge for the Chiang Kai-shek government. I took that chance to go to Shanghai, and somehow I managed to go to Shanghai for a few days to meet with Margaret.

Swent: Did you?

Engagement to Margaret in Shanghai, 1938

Lin: Yes. I cannot remember which year; it was '38, probably. I believe at that time, we got engaged; I managed to get her engaged. As I said, she was very shy. Never say yes, never say no. I chased her so hard, she said, "Okay." So we went to get engaged, I believe at a good hotel. A good one, twenty stories high, I think. At that time, it was very high. It's the International Hotel or something. Margaret may remember. Anyway.

Swent: That's where you had the party?

Lin: No, a small engagement party arrangement. I did buy a diamond ring for about $275, I remember, Chinese dollars. Half of one karat. I had to borrow part of the money from my sister. So finally we were engaged. But she could not go into the interior of China. It was very difficult to get in.

So after engagement, I went back to Hong Kong and finally back to the interior of China. I was asked to be the chief design engineer for a railroad, for the so-called Burma Railroad, from Kunming to Burma, a very difficult railroad. That road, I believe, now is completed under the Communists. At that time, they concentrated on building the highway, and that was a very difficult highway, across mountains.

Swent: Across "the hump."

Lin: Yes, yes. But I was working with the railroad headquarters in Kunming to build, first, a railroad to Burma, and later on--this was half finished, not even half finished, a quarter finished--then I was moved to build another railroad, also starting from Kunming, into Sichuan. Very difficult railroad also.

While working on that railroad, the Japanese tried to invade China from Hanoi. They took over Hanoi. See, things were different now. Yes, I worked in Kunming for a while, and then I decided to get Margaret to Kunming for her to attend school, college. So she went with her sister Yvonne and me to Kunming Southwest University Lianda to study.

Swent: Let me ask you: this brings up something again that I wanted to mention from Jonathan Spence's book. [p. 276] "When the approaching Japanese armies forced the university"--now, this is Tsing Hua University in particular that he's speaking about--"forced the university to move yet again in early 1938, Tsing Hua students joined with those from Beijing and Nankai universities"--

Lin: Exactly. We called it Lianda.

Swent: --"to form Southwest Associated University, abbreviated in Chinese as Lianda. In the city of Kunming, far to the southwest in Yunnan Province, the male students were instructed to walk from Chang Sha to Kunming, while the women and faculty were allowed to make the journey by train, traveling south as far as Haiphong in Vietnam, whence they could backtrack up into Yunnan via the Indochina Yunnan Railroad and so to Kunming."

Lin: Yes, yes. That's how Margaret traveled.

Swent: She was one of that group?

Lin: From Shanghai, yes. And I think I went to Shanghai to meet her, and took her--yes--took her and her sister through Hanoi--through Haiphong--along that railroad to Kunming.

Swent: So that railroad had already been built.

Lin: That railroad was built maybe forty years ago [before], under the French. The French were good engineers, but all the work, of course, was done by the Chinese. Very difficult railroad. I don't know; it has over 100 tunnels, or more, and several hundred bridges along that railroad.

So we took that railroad. It's a narrow track, a meter track.

Swent: One meter!

Lin: One meter track. You went--oh, round about, very interesting. So I took Margaret and her sister to Lianda to study, while I worked as engineer on the new railroad.

Swent: From Kunming to--

Lin: To the interior of China. First into Burma, and then to Sichuan, on these railroads.

Dismantling the Haiphong-Kunming Railroad

Lin: Now, while working on the railroad to Sichuan from Kunming, the Japanese were proceeding from Haiphong onto the boundary between China and Hanoi.

Swent: Vietnam.

Lin: Vietnam, Vietnam. The edge of Vietnam and China. I was given the job of taking the rails, dismantling the rails from the border line and transport them along the Haiphong-to-Kunming railroad, to Kunming, and re-lay them from Kunming to Sichuan. I did not do much; I think I probably did about fifty miles or whatever. At most 100 miles.

Swent: Sichuan is a province, isn't it?

Lin: Yes.

Swent: But that's adjacent to Kunming?

Lin: Adjacent to Kunming, Yunnan, but still about, say, 600 miles away.

Swent: Oh, a good long way.

Lin: It is a crooked road, very crooked road. I did some work. But the interesting thing was, one day--the train starting from the border line near Haiphong, came into Kunming, and going another fifty miles laid here. One day came two carloads of American supplies! My foreman and workmen got hold of them and opened them up! We got silk stockings, lots of them, chewing gum and rouge and lipsticks and everything. I think the Americans--I don't know, for whatever reason these were misdirected somehow. I got loads of it. And my foremen and laborers looked at those things, and in China we had never seen that before! So they just took the stockings away to their wives or their friends or whatever. And the chewing gum, didn't chew them--no, they didn't chew them, they ate them! They swallowed them! [demonstrating]

Swent: Like candy! [laughter]

Lin: Yes, they ate them like candy. They had never seen those before. That was very interesting.

I was in charge of the whole gang of so-called track-laying squad, to lay the tracks. Maybe three or four hundred workers. One day that happened.

Swent: Was Stillwell in China at that time?

Lin: I think it was just about the time, but I'm not in direct contact with him.

Also, there were trains of medical supplies and equipment that was destined for some American air force or whatever, never got there. It got to me. I got these carloads by chance. So I took all these medical equipments into the city of Kunming. We were familiar with the British consulate. The consul general was Prideaubrum, whatever the name was. He was the consul general from Great Britain in Kunming. They were adored and revered at that time. They fought on the same side with us, you see. There was no American consulate, so I had lots of medical equipment for the British consul general. So I took all these carloads of medical equipment to him, and I thought that maybe he could do something. Maybe he could get hold of the American people in charge of it, supposed to get this carload. I don't know if he ever did. I just hoped for that.

Swent: I'm sure they were very welcome, weren't they?

Lin: Yes, yes. And the British consul general was very nice to us, particularly I had two young girls, Margaret and her sister, Yvonne. These rather elderly officials, they love young girls. So he gave us Sunday picnics very frequently. I would bring those two girls along, and I would take part. We all had good times learning something about British.

At that time, Great Britain was very important in the war. And one day, he declared to me, "You know, Mr. Lin, the capital of Europe was lost." It was then that Paris was taken by the Germans. What year was that--I can't remember--probably '38 or '39. So, okay. The Germans invaded Paris; they took it. He said, "The capital of Europe is lost."

So, let's see what we do next.

The Remarkable Development of Railroads by the Communists

Lin: Okay, I keep on laying these railroad tracks, trying to reach Sichuan, but far away from it. I did pave, as I said, fifty miles of track and so on. It's a job that wouldn't end anywhere. I knew that this job could never be finished during the war. Now it is finished, but under the Communists. They built many very difficult railroads in China.

Oh, I wish Americans would go into that and make a historical study of how the Chinese have built so many railroads in the back yard of China, between Yunnan, Sichuan, Guizhou, Guangxi, Shanxi--very difficult. It's full of mountains. So they tunnel hundreds and hundreds of tunnels, and build hundreds and hundreds of viaducts and high bridges. We know nothing in this country. I happen to know this was done. So the Chinese have accomplished a great deal. I think one reason was Mao Ze Dong's fear of Japanese invasion of China, or even Americans' possible invasion. So they would build up their back yard. And moved certain industries there. That is all out of date now, and so on and so forth.

But anyway, I was doing that there.

Swent: At this time, were you aware also of Mao Zedong's organization? His Long March took place in '35, I believe.

Lin: Yes. I knew of the Mao Zedong's situation before I went to Sichuan; you were right, about '35. I was building railroads in Jiangxi where the Mao Zedong army was. I was on the Chiang Kai-shek side. The Mao Zedong army was no match to the Chiang Kai-shek people. So they would just chase them, chase the Communists. The Communists had nowhere to go, and took the Long March. Before the Long March, I was close to them. I did survey railroads near their camps and so forth. I was aware of that.

But what happened to the Long March, I did not follow.

Swent: How were you able to get information from one part of China to another at that time?

Lin: Okay. Essentially by mail. Chinese mail was very, very good.

Swent: It always has been.

Lin: But very slow, of course. Very slow. I don't know if by that time we had radio or not. If any, it was not very effective.

Swent: So you were receiving information by mail.

Lin: Essentially by mail.

Swent: Were there newspapers?

Lin: Oh, a local city like Kunming, they had newspapers, yes. We did get good news from these newspapers. They were, of course, all under the Chiang Kai-shek rule. When I came again to America, it was after the war--'46, '47. My American friends told me, "You were brainwashed by the Kuomintang." And my American friends were more pro-Communist. They thought communism in a way was good for China, and Chiang Kai-shek government was rotten. In my opinion, Chiang Kai-shek was rotten, but not nearly as rotten as what Communists did during the Cultural Revolution, which was horrible. Chiang Kai-shek was not well organized. He did need a new government; it's a very difficult job. I think Chiang Kai-shek did a great job in consolidating practically all of China. Japan was afraid he would complete his job, so Japan must take China now. When Japan tried to get in China in 1931, they claimed they wanted to get rid of the Communists for China. But as a result of the Japanese invasion, all the Chinese turned Communist. [laughs]

Swent: It was the reverse of what they expected.

Lin: Yes. The people were not satisfied with the Chiang Kai-shek government either. Only to find the Communists even worse. I think the whole transformation of China is a very difficult problem. Almost as bad as Mongolia. Can you imagine, to transform that into a modern country? And we hear, "You must have democracy." Do you think Mongolia could have democracy? Well, China is better, but still far from that. So we don't understand China.

Swent: It's just so huge, for one thing. Enormous size.

Lin: Do you know how big China is? Take the population.

Swent: One billion.

Lin: One point two billion. Which is the summation of all the developed world, entire Europe, plus North America, plus Russia, plus Japan. The total population is 1.2 billion. These are all developed countries, and China had 1.2 billion poor people, nothing to eat. I think they have succeeded a great deal in the last twenty years.

Swent: They have.

Lin: But still so far from the West. There's a big problem with China, and we don't understand it. I think the State Department does.

Swent: The professionals do.

Lin: The professionals do. I think Clinton listens a lot to them, and I have correspondence with these people. And they are very bright; they know about China. But our Congress, particularly the Republicans, they pretend not to know. They don't know, and they pretend not to know.

Swent: I wanted to ask you, too, about--there was a time when Chiang Kai-shek was kidnaped.

Lin: Yes. That was exactly when I was in Chongqing, that day. When I heard that, I shed my tears. Because Chiang Kai-shek was our hero, you see? He was held captive by the pro-Communists. The Communists were very wise, let him go, and Chiang Kai-shek stuck to his word. He said, okay, he will fight the Japanese. But because of the Japanese invasion, Chiang Kai-shek fell. Chiang Kai-shek tried to fight Japanese with whatever guns Chiang Kai-shek had, which was no match for them. They had a big battle near Shanghai; they were crushed. And then Chiang Kai-shek has no gun power fighting the Japanese. They ran to Chongqing. The government based on bureaucracy and money and very old-fashioned control in Shanghai and Nanjing moved to Chongqing, giving up all his bases, industrial bases, along the coast. They could not feed their officials. The officials were salaried at, say, three hundred dollars a month, they would pay only one hundred dollars.

So the whole Chiang Kai-shek system went corrupt. When you have no money for your own high or low officials, they go corrupt. So the Chiang Kai-shek government during the war changed from a reasonably good government, though corrupt but reasonably good, to a totally corrupt government at the end of the war. The Japanese invasion effectively destroyed the Chiang Kai-shek government, so people longed for something new.

And here came the Communists. Ha! We had new--socialism, communism! Very high powered for good reasons. But all the soldiers and generals were overworked and underpaid. So when after World War II, when the U.S.A. went to China to help the Chiang Kai-shek government, their soldiers turned over our armaments to the Communists. I saw the government became corrupt, from a reasonably good, though corrupt, government to a totally corrupt government. Every move you would make, you had to pay money. It was impossible. That's the real downfall of the Chiang Kai-shek government: people just--wouldn't take it.

Anyway, I have a lot of theories.

Swent: Well, it's a fascinating history.

Lin: Yes, yes. Now, where were we, myself?

Swent: Let's see. You had Margaret and her sister Yvonne at Lianda, and I think that's--it surprises me that her parents would allow her to travel with you. That sounds like kind of a modern--

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Swent: You were not yet married, you were only engaged, and you and she and her sister could travel around together? That surprises me.

Lin: Yes, yes. In China, we traveled just like pure friends, no kisses. The reason her parents had to do that was because Shanghai was surrounded by the Japanese, not taken. And the parents thought one would get better education in Lianda than in Shanghai. Shanghai was becoming also a corrupt place.

Swent: So this was a very advanced family, then, that wanted their daughters to be educated.

Lin: Yes, oh, yes. They were always well educated. So was our family, also Margaret's family. In China, we had this tradition. Certain families were well educated, and their rule was education.

Swent: So you were very advanced.

Lin: Yes, at that time, we were among the elite people. Not much money, but good education. And we were always taught not to depend too much on money, even to despise money. Because in the old China, you were told only two ways you could make money during the bad days of the government: you could be an official and accept bribes; you could be a rich merchant by giving bribes. You see? Everything is resolved by bribery. And officials accept the bribes. So we think that anyone who has money must go through the way of corruption. That's what we thought in Chinese, during the bad days. It's very, very interesting.

Of course, there were good periods in China, when there was no war, no fighting. And people were not corrupt and very straight, good government. But once it got into war, the government got misdirected and they all went into corruption. But actually, China is alternating itself between corruption and good government, say in the order of every 200 years, whatever. Good times 200 years; bad times 200 years.

So our family got to the point where we thought having money is generally no good, because those ages were very bad times.

Swent: You had mentioned that there was no money to pay the officials, and that this led to corruption. Were you paid regularly?

Lin: Okay, okay. I was paid regularly, because I worked on the railroad.

Swent: And they had money?

Lin: Railroad, yes, they had the money, I think from France and others for my railroads. France supplied part of the money. So we as engineers were paid regularly.

Swent: Did they provide housing for you?

Lin: Somewhat, but we could rent houses with low rent.

Swent: That was not a problem.

Lin: We as engineers were treated, especially with the railroad, with a tradition of very good government.

Building the Railroad from Xian to Chengdu as a Contractor

Lin: And that led me to the other part of my life: after this railroad-building there, which paid reasonably well. We were paid, and no corruption. And then, I thought that railroad-building from Kunming to Sichuan was not a real thing, it could never be finished under the conditions--again, no steel, no cement. Then, one of my former bosses, the famous railroad engineer, he was to build a famous railroad from Xian to Chengdu.

Just beyond Xian, there is a stretch, very difficult railroad along a small river, very difficult. So he knew me. His name was Ling Hun Shun. He was one of the famous railroad chiefs and very well known. So he was to build that railroad in the northwest--starting from Tien Sui near Xian. He figured out, he cannot get good contractors. All the contractors were organized under gangs, gangsters. One gang would have maybe a few hundred or few dozen laborers, and they would form a so-called company, but really just a gang. And they never know a good method of construction or accounting--they didn't care.

So he told me one day. He said, "T.Y., can you help me build this railroad, as a contractor?" I thought it was a great opportunity.

Swent: Where were you when you--

Lin: I was in Kunming. Now I jumped from Kunming to Xian. He said, "This railroad, we want you to set an example how to be a good contractor." So I took the job, organized a contracting firm which was awarded five tunnels and bridges along a very difficult section, about one hundred miles from Xian, maybe two hundred miles.

Swent: What did this involve as a contractor? How did you go about it?

Lin: Okay. You see, you start as a contractor in a place where there was no contractors, no firms, and no rules or anything. I was so young at that time--maybe thirty. Was I married? Yes, I was married already. Margaret was back in Shanghai, living with her parents.

Marriage in Kunming, Birth of Son Paul

Lin: Anyway, before I went there, I married Margaret in Kunming, 1941, married in a church, Western style. A good banquet, the money for which I borrowed. Oh, the banquet, maybe 200 friends. Margaret's professors were there, because my brother was a professor at Yunnan University, Kunming. So they all went to the party and recited some poems.

Swent: Were your parents there?

Lin: My parents were in Shanghai. Margaret's parents were also in Shanghai. Just Margaret and I got married there. Her professors would recite poems at the banquet. I remember one of them, from "Ode to a Nightingale."

Swent: Oh, really? In English, or a translation?

Lin: In English. Margaret studied English there, and some of the teachers were teaching English. They spoke Chinese, but poems they would recite in English, you see.

Swent: How interesting. What did she wear for her wedding?

Lin: For wedding, I think the Western dress. And I liked the red color, so she chose a red gown. She was very beautiful. She was the beauty of the whole college. The college, the professors, all envied me. "How did you get her?" Nightingale, this verse--"Being not envy of thy happy lot, but being happy in thine happiness." See, the professors recite these--[tears]

Swent: How lovely!

Lin: Anyway, we were married in Kunming, and she was still about a half year from graduation. But then we got a baby--she got pregnant. [laughs] So I had to send her back to Shanghai, because Kunming didn't have the facilities for good care of a childbirth. So she went to Shanghai in 1942 to her parents to give the baby, who is now our son Paul.

Swent: So he was born in Shanghai.

Lin: Yes. I think she left just the time of Pearl Harbor. She went through Hong Kong, where her brother was, and then en route from Hong Kong to Shanghai, Pearl Harbor took place. So she thought she was going to Shanghai, a safe haven, but it was the Japanese-occupied area. This was very tough for her. You should get her to tell the story.

When she arrived in Shanghai by boat, nobody met her. The whole thing changed; it was under Japanese rule. Her parents were all in somewhat trouble. But the Japanese still let them live. Not like Nanjing, the massacre. They left Nanjing a few months before the massacre; they were living in Shanghai.

In Shanghai, she gave birth to Paul, April, 1942. And then, her parents were requested by the Japanese to serve the Japanese. And he [her father] refused. To do that, he had to go into hiding. Eventually, a few months, her parents secretly left Shanghai and went to Fuzhou, which was not occupied by the Japanese. After a few months, Margaret and her elder sister came together from Shanghai to Chongqing to meet with me.

Swent: What was her sister's name?

Lin: Kay. Her American name is Kay.

Swent: So they went to Chongqing--

Lin: From Shanghai across the Japanese front lines, which is just where the Three Gorges Dam is now being built. Now, this part I'll let Margaret discuss one day.

Swent: With a baby!

Lin: With a baby. For fifty-one days, they walked by foot, and by mule, and everything, finally got there. So this part, we'll let Margaret say one day, but--

Swent: Yes.

Lin: So she got to Chongqing while I had been transferred from the railroad near Xian to Lanzhou, Gansu Province. Going back to the Xian days. It's very, very tough working on the railroad as a contractor. Even though I had direct access to the chief engineer, conditions were terrible. I had to walk from Tien Hsui, Heavenly Water, which is near Xian. From Tien Hsui on, its a very tough railroad.

At that time, I recruited a helper from my old university who was twelve years behind my graduation, Mr. Y.C. Yang. See, Yang has worked with me for over fifty years. He's still here in San Francisco. The conditions were so tough. I didn't know how I could handle it, and I didn't know how he could handle it. We had no rice to eat, so you would get some corns in its place. No modern facilities. It was terrible.

But anyway, we drove I don't know how many tunnels, at least five tunnels in hills and built bridges along the railroad, which was finally completed by the Communist regime.

Swent: How did you drive these tunnels? How were they driven?

Lin: Okay. They were driven with--sometimes we got dynamite, but more often, we got only gunpowder. Most of the time, they were drilled by hand. Hammer. So we got these Chinese gangs--they were all gangsters. They earned some money, stopped somewhere and smoked opium. Terrible.

Swent: You had to find food for them as well?

Lin: They ate just as bad food--worse--than what I had. That's the only food they had there. Whether they work or not, you didn't get rice all the time. You got partly rice and partly corn. Very seldom you had any meat.

Swent: Did you have to supply their food for them?

Lin: Locally. Locally we had to, yes.

At one time, we had to print money to give to them. We had no money there, so we told the contractor, we would print money and give to the laborers. Then we set up some shops where they could buy things.

Swent: What about safety considerations? Were there lots of accidents?

Lin: Yes. Safety was not a big concern. People were hurt right and left. Not really killed, but it was very poor health.

Swent: What sorts of accidents were there?

Lin: Well, it's all working accidents, nothing really too serious. I'm thinking of one in Sichuan before that time, when we were blasting--I think I told you--blasting a tunnel here, and the rock flew 500 feet across the ravine and hit and killed a person. Life was cheap. Workmen died, just like soldiers died. Anyway, where are we now?

Building a Dam in Lanzhou

Lin: So I was in Xian, and then another good friend who was high up in the hierarchy under the Chiang Kai-shek regime, Mr. Shen Yi, he could get directly to Chiang Kai-shek. So he was sent to do development in the Lanzhou area, Gansu--you know Lanzhou? Close to the Mongolia, but not yet. Lanzhou is a very interesting, nice place. Decent place in the interior. Good weather, almost like Berkeley, and fruits, just delicious. Melons that tasted excellent. Now it is a well-developed area. At that time, we were trying to build a dam beyond Lanzhou. This is something again never finished due to the war. So I was there, and--

Swent: The dam also came under the railroad department?

Lin: No, by now 1943, I left the railroad. After the Xian job, I left the railroad. The one reason I took the Xian job was the way that I was trained. I did not like corruption. At that time, the railroad was getting--the whole government was getting--corrupt. So if I were to continue my work to serve the government, I would receive very low salary, and may be forced into accepting bribery. So I had to go as a contractor, if I would get more money, but without being corrupt.

Swent: Who would bribe you, and why? Who would bribe a railroad engineer?

Lin: The contractor. [going to answer ringing phone] That's why I turned to be a contractor, making some money without accepting bribery. [tape interruption]

Swent: I'm unclear as to why would anyone bribe a railroad engineer?

Lin: Okay, okay. Suppose you take off this piece of rock, say it's one hundred yards. I report it as two hundred. You see? So you get more pay to be shared between the engineer and the contractors. So there's bribery. Both get more money that came from the public. It's not often, because the railroad was better managed, but I saw it coming, and I said I've got to quit. So I left to be a contractor, only to find out that contracting was very tough. But I got more money legally.

Swent: So you finished the contract in Xian?

Lin: Xian, yes. Finished the contract in Xian, and went to Lanzhou in Gansu to build a dam, Yuan Yang Dam, some four hundred miles north of Lanzhou. That was also not finished when the war stopped. Since we were trying to build a dam without any major equipment, we did not accomplish much, but I understand it is now finished under the Communist regime.

Now, all this time, Margaret was in Shanghai, then trying to go through the Yangtze gorges into the interior. She finally arrived in Chongqing. I was so busy working that I did not fly from Lanzhou to Chongqing to meet her. Instead, she flew from Chongqing to Lanzhou.

Swent: This was the first time you had seen Paul?

Lin: Yes. He was how old? Probably less than a year. Yes, less than a year.

Swent: And in that time, were you able still to communicate with each other?

Lin: Yes, letters.

Swent: You could send letters? It's amazing!

Lin: Yes, it's amazing. The Chinese mail was pretty good.

Swent: Even through the Japanese lines?

Lin: Yes. They would go roundabout. It would go through somewhere. At that time, there were also airplanes, so air letters. Yes. [chuckles] See, the Chinese would fight these wars, provided they decide it's worth fighting for. They can suffer. They rather suffer without surrender. That's what we Americans don't understand. The Chinese can survive very difficult conditions. You cannot easily conquer them.

Swent: They're survivors.

Lin: They're survivors. Some Westerner told me the West learns how to get along with something--how to drive, how to fly--how to get along with something. The Orientals learn how to get along without something. No automobile? Okay, walk. Chinese are very good at that. [chuckles] I think that's probably true because of the lack of everything in old China. And here we have so much. So poor John F. Kennedy, Jr., he had to fly and did not survive that accident. In China, "Oh, it's too dangerous, don't fly."

Just get along without an airplane. It's very interesting. Anyway, where were we now?

Swent: When were you in Lanzhou? That was in the 1940s?

Lin: Okay. My stay in Lanzhou ended with the war, '45. I was in Lanzhou '43 and '44 for at least two years.

Swent: Paul was born, you said, in 1941?

Lin: We were married in '41, he was born '42. She came to Lanzhou, '43. We stayed in Lanzhou from '43 to '45. And then the night of Japanese surrender. Wow! It was so happy, so we marched. And sang the Kuomintang national song, Sun Ming Tsu Yi, et cetera. That's the result of the atom bomb; otherwise the war would not have ended so fast. That was in 1945, August.

IV MANAGING FIFTY-THREE RAILROADS IN TAIWAN, 1945

Chiang Kai-shek Supporters Leave Mainland China at War's End

Lin: Now, before the war ended, Margaret talked to me, and she wanted to see America, particularly to see the movie stars, because she was crazy about movie stars. Oh, she would remember all the movie stars' details, which I cannot, but she does. So she wanted to go to America.

So I wrote to my old professor at Berkeley, Bruce Jameyson. He was then chairman of civil engineering at Berkeley, Bruce Jameyson. I told him that my wife wants to see America; can you give me a job for a year? This was probably the beginning of '45. The war ended in '45, August. By October or something, I, together with other Chiang Kai-shek people, went to Formosa. I had the choice to move to Manchuria, Formosa, or Nanjing area. I chose Formosa--Taiwan--because I thought it was safer. I saw the Communists coming over by that time. If I went to Manchuria, I would be taken by the Communists. I was somewhat anti-communist at that time. Nanjing was not so safe, so I chose Taiwan.

So I had the job of going to Taiwan to take over--

Swent: Was it called Formosa at that time?

Lin: Yes.

Swent: I think Formosa is the Japanese name of it?

Lin: I think it started with Portuguese, Formosa, meaning "Beautiful Island." Anyway, so I went to Formosa or Taiwan, assigned the job of taking over fifty-three small railroads, each belonging to a sugar company run by the Japanese. The Japanese produced sugar in Taiwan. Every sugar company has such an area, and they lay small tracks, about two-and-half-feet tracks, less than a meter. Fifty-three companies with fifty-three railroads. So I helped the Chiang Kai-shek government take them over.

The Japanese Occupation of Formosa: Harsh, but Stable

Lin: Are you interested in political remarks that I would make about this?

Swent: Yes, indeed.

Lin: We went over as a pure engineer, but many of the Chiang Kai-shek people went over as corrupt officials. I think they treated the local people like a conqueror, looked for money. That really enraged the Taiwan people, so after a few years of that, there was a big rebellion of the local people against the Chiang Kai-shek group. They killed a lot of outsiders and the local people were massacred by the Chiang Kai-shek soldiers. In other words, the Japanese had left Taiwan, Chiang took it over, but did not govern it right. So people said, "I'd rather be under Japanese. At least they had their laws." The Japanese conquerors were not corrupt as far as their laws are concerned. But their laws were so bad, when I took over the railroad from the sugar companies, every company, anything above a small leader was Japanese. All below was Chinese. Chinese were never allowed to be the chief in any part of the company. Much worse than the British governing Hong Kong, much worse. The Japanese colonial system was very, very bad. However, they had the law. If you didn't obey the law, well, cut off their finger! Very severe. But that means there was stability. It's very bad, but as long as you obey the Japanese government, you may be okay!

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Swent: You were saying that under the Japanese, there was at least stability.

Lin: [laughs] They'll do anything.

Swent: So the Japanese were cruel but not--

Lin: Very cruel, but they had a law. When the Chiang Kai-shek went over, they practiced bribery without a law. Their people, perhaps their soldiers, I don't know, but I know that people were already corrupt in Chongqing. The reason they were corrupt was because most of the officials were used to the Shanghai-Nanjing coastal style, with a reasonable standard of living. Under the Japanese attack, Chiang Kai-shek government was not able to pay them that, so they became more and more corrupt.

So when these soldiers and officials went to Formosa, they did not practice the best service, civil service. The Taiwanese rebelled about two years later, but by that time, I left Formosa already. But anyway, I went to Taiwan and took over these railroads, fifty-three of them, and combined them into one.

Swent: That sounds like more of an administrative job than an engineering job.

Lin: Exactly, exactly. Now I think the railroads were dismantled: they were too small to be effective.

Swent: That must have been a nightmare.

Lin: Yes, and sugar making is not a good business in Taiwan any more.

A Job Offer from Berkeley, Acting Assistant Professor

Lin: So anyway, I went over to Taiwan with Margaret and Paul. Remember Margaret said, "I want to go to America," and I did write a letter to Professor Jameyson at UC Berkeley in the early part of 1945, before the war ended. So he replied to me and said, "Yes, we will give you a one-year position of acting assistant professor." The reason for that was because of my thesis, which as I said, on so-called direct moment distribution, became a classic paper. And I did teach here at Berkeley privately to the students, and got a good name.

So he said, when I came, that "You are the only Chinese who we have given this professorship because of all you have done." Anyway, he offered me this position. I remember three hundred dollars a month, $3,600 a year. That was a lot of money at that time, to me.

Swent: It was a lot at that time, yes.

Lin: Anyway, the letter arrived in Taiwan by about December of 1945. I was taking over [the railroads] there, and one day, I got this letter. The letter was all wet. It went through the interior of China, and it came through Lanzhou, through Chongqing, et cetera--I don't know how long it traveled. It took almost a year, but finally it got to me in Taiwan.

Swent: It's amazing.

Lin: Amazing, yes.

Swent: You must have been very excited when you got it.

Lin: Totally excited, indeed. That's great! "Okay, we go to America!" So soon, a few months later, I left. I left Taiwan to go to Shanghai, to take a boat to America. I got the letter late '45, and in '46, about August, I arrived at Berkeley. At that time, there were no U.S. professors from China. The only one well known was Tsien Hsue-Shen. Tsien Hsue-Shen was the very famous aeronautic engineer, credited with helping the Chinese developing the first airplane and then the rockets, perhaps even the atomic bomb. He's very well known.

Swent: And he was here at Berkeley?

Lin: He was not at Berkeley; at Caltech.

Swent: Did you know him?

Lin: I never met him. But many of my friends know him. He was teaching aeronautic science at Caltech, and Americans somehow didn't treat him right, he thinks, anyway, so he went back to China. If we had treated him well, it turned out--I asked another Berkeley professor about this--if Tsien Hsue-Shen did not to go to China, what effect would it have? Three to five years delay in the development of aeronautics and aerospace, he said.

Anyway, he's very bright, very bright.

So I said, "Okay, I'll come to teach." But the American consulate in Shanghai will not grant a visa to Margaret. So she could not come with me. I came in 1946, about August, and Margaret arranged all these procedures, came the year later, 1947, January. But that's a big change, to change from the old place back in China to this modern California.

V UNIVERSITY OF CALIFORNIA, BERKELEY, 1946

Starting All Over

Lin: What could I do to start teaching simple courses? Surveying, which is no longer a course now, but at that time you had transit, levels, and all that. I started all over, for a few years, and taught mechanics of materials, a standard course. I taught those things, as a start.

Apparently, I did all right. But occasionally, some of my students told me these days that, "Professor Lin, we didn't quite understand your English well enough." [laughs] In general, it's okay.

So anyway, started teaching here. My interest was really in structural engineering, and eventually leading to bridge engineering, which I studied in China. The professors I had here, Professor Jameyson and Dean Derleth, were good bridge engineers. So I began to start in the direction of bridge engineering.

Visiting European Engineers Talk About Prestressed Concrete, 1950

Lin: But the most important thing was, some famous engineers from Europe came to Berkeley and talked about prestressed concrete, about 1950, which was a subject totally new to me. I never heard of it. But after I heard some of these lectures, I thought, This is the field that I can develop.

Fulbright Fellow at University of Ghent, 1953-1954

Lin: Meanwhile, I've been working with the state bridge department in Sacramento and so forth, and finally, my friends recommended me to apply for, and finally get, a Fulbright research professor fellowship, which gave me a year in Belgium, 1953 to '54. That really gave me great help, because this so-called prestressed concrete was invented by a French engineer called Freyssinet. The second well-known one was Professor Magnel, of Belgium. So I got a Fulbright grant to go to Belgium to work at the University of Ghent under Professor Magnel. He had a whole laboratory built for him called Professor Magnel's Laboratory, as big as our laboratory here. He was very well known.

So I worked with him for one whole year, and I learned a great deal, a great deal. Because he had a laboratory, and I worked in the laboratory with him and his assistants. At that time, I had Margaret and Paul and Verna. Verna was born in Oakland in 1949. This was Verna who phoned just a while ago. So we four had really a good time in Belgium. The income was very limited, but enough to survive. We rented a small apartment, but we traveled throughout all of Europe this year, and saw almost every country in Europe.

Swent: What languages were you speaking at this time?

Lin: Okay, we got by with English. Now--I think we essentially got on with English. Of course, we knew some French, some German. But essentially, people there speak English after the war. That was the year 1953 to '54. When we went there, we were in England, we were very welcome because by that time, I was already well known--I wrote papers published internationally. The British people are a little jealous of Americans. So was all the rest of Europe, just after the war. But we got by very well.

Swent: You had written other papers, you say, by now?

Lin: Yes, already. By that time, I had written several papers, maybe five or ten papers, on prestressed concrete construction and design. Before I went, during 1951 and '52, I designed some prestressed concrete buildings in San Francisco. One was called the Lick Garage at the Lick Place downtown. Big prestressed concrete beams supporting columns on top, and leaving the ground floor free for parking and maneuvering.

Swent: Is it still there?

Lin: I think it was dismantled, because the land has become so costly; it was a five-story building, but they dismantled it now. Another is called Downtown Parking Garage, ten stories high. That's also prestressed concrete, which I designed, with Ellison and King, structural engineers. So I designed certain things, and these were unique at that time, so I wrote papers that were published nationally and internationally.

Forming T.Y. Lin Associates to Do Outside Work, 1953

Swent: How did you come to design these buildings? You were teaching here at Berkeley.

Lin: Very good question. Now, while teaching at UC Berkeley, it has a rule, you can do outside work provided you do not affect your duties at the university. Provided you perform well, you could do outside work. So actually, I set up a firm called T.Y. Lin Associates in Los Angeles with one of my former students, Edward Rice, actually in charge. I split with him everything fifty-fifty. Both of us earned some money that way.

He knew how to promote. He got in touch with the industry and the profession. And I supplied the technique. We started that office in 1953, just before I left for Belgium. During my one year in Berkeley, we talked long distance, "Please tell me the problems"--there was no fax at that time--over the phone. What problem it is, how big a beam and column, what should we do. And I, through the phone, directed him how to design that structure. That year in Belgium, I took a little time off to solve these problems that no one else could solve, by long distance, and he carried out, see? At that time, we organized T.Y. Lin Associates in Los Angeles. No one else knew how to do these things.

Swent: What problem was that?

Lin: Okay, usually design of buildings. We usually designed buildings. Occasionally bridges.

But you see, he was very, very good. He knows how to organize and contact business. After one or two years, or three, whatever, we were serving as consultants to fifty-three precasting, prestressing plants in the U.S.A. So actually, I just supplied the technical know-how; he ran the management. I had to go occasionally to these plants to give a seminar here or a talk there. So we were paid by these plants. That developed the whole industry of pre-tensioned concrete. Fifty-three plants around the country! So we published bulletins for these, which were distributed to all of them. We called them Lin-o-grams. I think I gave you some of these, to the library.

Swent: I think they're in those boxes there at The Bancroft Library.

Lin: If not, I still have them here. I'll dig them out. Anyway, at one time we started the whole industry by supplying the high tech, see, in concrete engineering. Not many others knew the technique. We got fairly well paid for these consulting services. After he discharged all the expenses in the office in Los Angeles, then we split the money.

Swent: I'm wondering why did you do this and nobody else? I mean, here were Derleth and Jameyson, both engineers, other students and teachers--

Lin: Very good question. You see, this is entirely the development of a new frontier. There was reinforced concrete, very well known. Prestressed concrete only started in Europe, seldom if ever used in this country, although there were one or two occasions. I not only knew how to do it, but I can explain it such that people will understand it, and use it. And I happened to have my partner, who was very capable, to manage all the contacts. The money made was not very much, but still it's additional to me, and for him--Edward Rice is quite a wealthy man now, in real estate as well.

Swent: Are you still working together?

Lin: No. We'll come to that later. But we worked together for about ten or twenty years, I can't remember. Then he's so capable in making money, he owns something like seven blocks downtown Sacramento. He owns part of that, but still, that's a lot of money. He's very capable, and I just leave the whole thing to him. I said, "Okay, anything we divide fifty-fifty." I supplied the techniques, he did the management.

The Textbook Brings World Fame, 1955

Lin: When I went to Belgium, John Wiley Publishing Company told me, "Professor Lin, can you write a book for us?" Because I did write some papers before. Then I thought maybe that was the thing to do. So while in Belgium, I wrote a whole book [*Design of Prestressed Concrete Structures*], 1953 to '54. Although I only designed five or ten buildings before it, I did learn something from Europe. All the European books were not understandable. The authors were good mathematicians; they knew mathematics, but never get to the bottom of the theory.

I got to it, and I wrote it in a language which Americans could understand. So once I wrote that textbook in Belgium and published it in 1955 here, it just swept the whole world. It was translated into Russian, Spanish, Japanese, and so forth. Because finally people could understand the theory. That made me very famous.

Swent: So it was the book that was one breakthrough. But you would not have been asked by John Wiley to write the book if you hadn't already been an expert.

Lin: Yes. You see, I was asked by them because I wrote several papers. They knew that I must know the stuff. They came to me and said, "Can you write a book?" I said no, but just before going to Belgium, I thought maybe I should. So I gathered all the material ready; I spent one year, and I wrote that book, '53 to '54.

Swent: Did you have help with the writing of it?

Lin: No. I think, now thinking back, my partner, Ed Rice, was asked, How can T.Y. do all this? "You don't know how fast he acts." See, I think and act very fast. In one year, before that, I knew very little. How could I write a book in one year? You see? The book is organized and presented in such a manner that people can understand it, and I developed new theories from simple basic theories. Make very difficult things very simple. That's why I can solve a problem by telephone across the ocean. I didn't realize it myself, but now I begin to think I was very fast. I see the basics right away. And write it. My English is not that good, but it's not bad. It's good reading for students, anyway.

Okay, now, where are we?

Swent: Had Professor Jameyson encouraged you to write these papers?

Lin: No. You see, the natural surrounding is such in America. You know something, you have to write papers. You get better known. To be a professor, you've got to write.

Now, the difficult thing was that I seemed to run a big business, but teaching full-time at Berkeley. As I told you how I did that, I put my office in Los Angeles. If my office were here, they'd come and trouble me all the time. In Los Angeles, they can only telephone. And I solve these over the phone.

Swent: Did your consulting, though, enrich your teaching in any way?

Lin: Oh, now, this is very important. Because my teaching soon becomes centered on prestressed concrete. I gave a special course on prestressed concrete, especially just after the book was published, 1955. So my work outside supplemented my book, and my book supplemented my teaching. So the two seemed to work together very, very well.

But I did work on the average of at least sixty hours a week. But it's all fun for me, as well. I never worked hard. I just thought it was fun. Because you've got a new profession, new engineering, and everything was being developed, and you could see the results. On paper, you publish articles and books, translated all over, on buildings, and others.

And then I of course helped establish the Prestressed Concrete Institute, after having been in Europe. So I joined the European organization with the American organization. I never served as the president of any of these. I was very active and important. Margaret told me, "Don't you be a president! It will keep you so busy, I'll divorce you." [laughter] She didn't mean it, but I obeyed to that. I didn't want to be president of anything, but at one time, I was chairman of six committees. That I could handle.

Swent: That's where the work is done.

Lin: Yes, yes.

Swent: Tell me, what made prestressed concrete possible at this time? Were there new developments in materials that made it possible?

Lin: Yes. It is the development of new materials. The new materials essentially were two. One is the high-strength steel wires. They work five times harder than the ordinary steel, and cost only a little more. This high-strength steel wire is one. Secondly, high-strength concrete, concrete that is tough. So to make these two work together, we've got to pull the steel to develop its force and hold it onto the concrete.

Swent: And why had the steel not existed before?

Lin: Not before. Regular steel was regularly used for construction before high tensile wires, gradually developed to a point where this was so much stronger that it's clearly more economical. So we had to make these wires work structurally, by combining it with concrete carrying compression. Economical structures results. That's very important.

So I helped these fifty-three plants each to build these products, and they got the business by pulling the steel, holding it onto the concrete. The concrete must be strong to be able to absorb that push, and the steel must be strong to be pulled to a high stress. So the steel wires and the concrete work together. Besides, if you compress the concrete first, it will not crack easily. It already begins to work.

At first, Freyssinet invented prestressed concrete, emphasizing that by pressing the concrete, the concrete will not crack easily. I emphasized the interaction between the steel and the concrete. To use the steel, you have to pull it. When you pull it, it creates a desired force on the concrete. So my theory is more comprehensive, because it deals with steel and concrete and it went all over the world. Actually, it's first the development of the materials; then, the equipment necessary to pull the steel. Then the theory and the practice.

In the real world, you need to put these into practice. That required the setting up building codes, of which I acted as chairman many times, and I was a member working on the codes. Then we designed them for certain structures, and built them. After they're built, they were shown to be cheaper and better. So actually, I developed a lot of that.

Swent: The dancer [Margaret] has come home.

Lin: The dancer is back. What time now we have?

Swent: It's a little after eleven. Do you want to continue?

Lin: I'm okay.

Swent: Let's continue. Now, you started off on just a one-year contract here at Berkeley as a--

Lin: Yes, yes. I still had a one-year contract. I thought I would maybe go back to China next year. But at the end of the year, the Communists took over most of China, and I at that time was anti-Communist, old Chiang Kai-shek's people. There's a story, when the Chiang Kai-shek government in Taiwan wanted to extradite me from America saying I'm Communist--

Swent: Really?

Lin Falsely Accused of Being a Communist

Lin: Yes. It was very interesting. And this, fortunately, I had the help of UC President Clark Kerr. Clark Kerr knew me. He wrote a letter to the American consulate saying, "T.Y. Lin cannot be a Communist."

Swent: Why did they think you were?

Lin: Why did they think I was Communist? Because Taiwan at that time had this big trouble with the local people, and they revolted against the mainland army and the people. They tortured and killed thousands of mainlanders, including my cousins and my friends. Then Chiang Kai-shek reinforced his army from the mainland and crushed the revolution. His secret service agents then launched a house-cleaning search and one of them found a letter from me written to my friend Mr. Shao in which I asked him to study bridge loadings in Taiwan as compared to America since I was serving as chairman of ASCE Committe on Bridge Loadings. I asked them to gather material for me. So the agents said this was secret gathering of materials to help mainland Communists against Taiwan. In fact, the real reason was my friend Shao was in trouble with the local secret police for some other disagreement.

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Swent: So your friend was gathering this material?

Lin: Yes, to send to me. His local secret enemy agent used the occasion of the rebellion to search his home, and got one of the letters in which I said, "Communism may not be that bad. The Nationalists may be no better." Thus the agent said, "So your friend Lin is a Communist."

Actually, the trouble was, I was so influenced by American freedom of speech, so I said anything that I wanted to, without thinking twice. At first, I was very much against Communists, and then I thought, Maybe it's not that bad. So he got that letter, "Look here, your friend is a Communist. And you're gathering these loadings for secret reasons."

So they issued a subpoena to the Chinese consul general in San Francisco to extradite T.Y. Lin. The consul general happened to be a relative of mine. [laughs] He called me up and said, "T.Y., I received orders to extradite you," but I was already an American citizen by that time, you see. So they couldn't do that.

But then I complained to UC President Clark Kerr, and Kerr wrote a good letter to the American consulate in Taiwan, asking him to tell the Chinese government how T.Y. Lin was no Communist.

A few years after that, one day, the high official in Taiwan who charged me with communism was here in Berkeley at Professor Chao Yuan Jen's dinner. Professor Chao of Oriental Languages, very famous faculty member. I was there at the dinner. And Professor Chao told him, "This is the person you called the Pirate Lin, Lin Fei. Communist. You called him Communist; he's no Communist." [laughs] I never thought writing a letter like that --got into the hands of the secret agent, and then they would charge me with communism.

So that put me in a very bad position with the Taiwan government. But all Taiwan good people knew that T.Y. Lin is no Communist, even though I sometimes said communism might have existed for good reasons.

Later, my friends in Taiwan tried to make me an academy member of the Academia Sinica. That's a very high honor. One of them was that Ling Hun Shun, an elderly engineer: "We've got to make T.Y. Lin an academy member." It took him five or ten years. Finally I was elected a member of the Academia Sinica in Taiwan.

Swent: When did you become an American citizen?

Lin: I think it's about '52 or '51. Five years after I came.

Swent: So you must have made the decision by then that you would not go back to Taiwan.

Lin: Oh, yes, oh, yes. Life here was so good. Taiwan or Shanghai is just not comparable. I think I was made a citizen in 1951.

Swent: And did Margaret become one at the same time?

Lin: Yes. Maybe a year later; she came a year later than I.

Swent: So it was not a hard decision to make?

Lin: No! Margaret told me, "T.Y., when we came to America, I never thought of leaving." And then I took her to see all the movie stars I could never see in China. [laughter]

Swent: And of course, you had other relatives here also, didn't you?

Lin: Well, by now, all my brothers and sisters were here, eleven of us. Some died here. I first came because of my brother, so he helped. But the others all came sooner or later.

Swent: Had this brother stayed here all through the war?

Lin: The elder brother who helped me?

Swent: The one who was here when you came in the thirties.

Lin: No, no. Brother T.C. went back to China by 1935. The elder one. He suffered during the Cultural Revolution. He was--how do you call it?--under arrest or detention, for several years. And one day, I think it was 1973, when Nixon visited China, some Communist cadres came to his house, "Mr. Lin, you're released. You're released. You're free." Because Nixon would come to Shanghai next week, and T.C had Ph.D. degree from California, and Nixon was also from California. So he got freed. [laughs] Oh! That's why, the ignorant people control the power at that time. They did things just like that.

Also Criticized for Being Anti-Communist

Lin: Now, another story: after being cleared of communism by Taiwan, about fifteen or twenty years ago, when representatives of Communist China visited Berkeley, their Communist party members were very mad at me. "You are anti-Communist!" Why? Because of the bridge I designed for Taiwan was built; it's called Kwang Fu Bridge. Kwang Fu means Recovery. Recovering the mainland. In fact, I did not give it that name, but Taiwan government did, because they thought they took back Taiwan from Japan, Recovery. But the Communists looked at it as saying, you want to take back all of mainland China. But I only designed the bridge. The Communist members from PRC said, "Oh, this is terrible. You are against communism. You want Taiwan to take the whole mainland."

So sometimes in life, you deal with those ignorant people, and their thinking background is different from yours. You have to understand them. I never fought with those people really. They say I am a Communist; I am not. They say I am anti-Communist; I am not. I don't care.

Swent: You're above all of that.

Lin: Above all of that. Above all of that. Very interesting. So that's the story. We'll go to some more important business. [laughs]

Oh, okay. The Russian--this is the whole story, the war conference and in touch with the Russians. Let's finish this part first. You ask some more questions.

Swent: Well, yes, maybe we could mention that world conference in 1957.

Lin: Yes. That's a very good one and a very long one. It will lead to our contact with the Russians.

Swent: Perhaps we should save that for next time, then.

Lin: Yes, we can save that for next time.

Swent: We'll begin with that next time. Where were you living at this time in Berkeley?

Lin: Vincente, in the Thousand Oaks area. We lived in a rather big house, four bedrooms--not as big as this one--until 1966, we moved here.

Swent: This house was built in 1966?

Lin: Margaret, when did we build this house? When did we move over, 1966?

M. Lin: Where?

Lin: Here, move in this house?

M. Lin: '66.

Lin: '66, yes. We lived in Thousand Oaks area.

Swent: So your children went to school in Berkeley schools?

Lin: In Berkeley, Thousand Oaks School. So both our children, Paul and Verna, went to Berkeley High School, and then UC. They both went to UC. Both have master's degrees.

Ballroom Dancing and Movies

Swent: When did you begin dancing?

Lin: Okay. When here, Margaret always loved dancing, but she never had a chance. Maybe danced once or twice in China. I knew she wanted to dance. And one day, we heard from the radio Arthur Murray advertising, "Name the tune." So I took the telephone and they sing something, and they say, "Name the tune." Whether I named it right or not, I don't know; they said, "You're right!" So we went there. But before that, we did take some lessons from some private teacher; she was a poor one. Then finally, we joined Arthur Murray maybe about 1957.

Swent: Here in Berkeley?

Lin: In Berkeley. We started dancing in Berkeley. She danced, oh, I don't know, twenty, thirty years now. So many exhibits all over, with Arthur Murray competition. I'll let her tell the story.

Swent: And you also mentioned the movies. Were these American movies that you were seeing in China?

Lin: Yes. She knew all the American movies, all the famous stars in the movies shown in China. We saw those before we were married, after we were married, and she's crazy about these movies. After we came here for the first year, we lived in Richmond. These were housing projects. It was a crowded area. We went to see movies frequently; in one year we saw 240 movies.

Swent: Oh, my!

Lin: Because some of them were double features. She just loved movies. The second year, we went to Hollywood and saw many real movie stars. I'll let her tell.

Swent: You must have had a babysitter.

Lin: Oh, we didn't know the rule of a babysitter, so we left them home, didn't know we required a babysitter. So we let Paul manage Verna. Paul was only maybe ten years old or something. We continue that for several years without knowing that we had to have a babysitter.

Swent: Oh, really? You just left your children alone and went to the movies?

Lin: Yes, yes. [laughter]

Swent: You also mentioned that you went to this social engagement at Professor Chao's home. Was there by then a Chinese academic community that you were in touch with?

Lin: Yes, yes. Not a community, but quite several. Professor Chao is a very well-known one here, in Oriental linguistics. And there was Professor Chen, also a Chinese, and several others I think by that time.

Swent: So you formed a social group?

Lin: I think Chinese became a social group only recently. Maybe twenty, thirty years. More in engineering and electronic engineering, and then Professor Kuh, Ernest Kuh, he's dean of engineering, and finally Tien Chang-Lin becomes chancellor at Berkeley. Chinese people became more prominent in the last twenty or thirty years. When I came, fifty-five years ago, I think I was the only Chinese from outside. There were one or two Chinese, native-born Chinese faculty members. Professor Ma was one, teaching political science. Not too many, anyway. After Professor Ma, I was the first Chinese to teach at Berkeley. Now there's plenty.

People ask, "Do you feel discriminated here as an Oriental or Chinese?" Yes and no. You are, in a way, but in other ways, you're not. The trouble with most Chinese, and other minorities, they feel they are minorities. So they react in a minority way that just makes them a real minority. If you don't feel that way, you're quite okay. In fact, I think I benefit in a way, because being Chinese and somewhat prominent, you get better known. Things have both sides.

Swent: And of course, California has--

Lin: It's so diversified. Okay, what time do we have?

Swent: I think we may have reached a good point to stop. What do you think?

Lin: Yes. But we will continue next week? Know what to do next time.

Swent: So next time we'll begin with the Russian conference.

Lin: Oh, Russian, that's good.

Swent: That had a lot of consequences.

Lin: Yes, yes.

Litigation and Business; the Old Chinese Way Was Better

[Interview 4: August 10, 1999] ##

Swent: Let's begin with the fact that you're having to do some repair work in your garden here, and I jokingly said something about people suing people nowadays, and you said that in the old days in China, that you didn't sue people. How did you handle that?

Lin: In the old days, you had tea houses. When you disagree, you go to a tea house and discuss it, and settle it. You can get an elderly person to be sort of the--what do you call that?

Swent: Arbitrator?

Lin: Arbitrator. So you always have it at a tea house. I think it was much better managed. But nowadays, the world is becoming so complicated, you need a lawyer for everything. Also, there's a lot of money involved. And again, people care more for money than for friendship, so they cannot use the tea house any more.

Swent: I'm sure that's a change that you have seen in your business, haven't you? More litigation.

Lin: Yes. I must have half dozen to a dozen litigations or more during my professional life. It's very interesting. I'll say that I won most of it and settled some of it. An insurance company paid after the deductible and settled the problem. I've been quite lucky in litigations.

Also because my father was trained as a lawyer. He was a judge on the supreme court. So from youth, I started to know a little bit about law. That made me handle the thing quite well during my professional life, and that's very, very important.

Swent: That's one of the things that they probably didn't teach you in engineering school, did they?

Lin: No, they did not.

Swent: But it turned out to be an important thing to know.

Lin: Yes. The first partner I had was Edward Rice. We were very close. He and I helped develop the whole industry together. After many years, maybe fifteen years, we finally parted. But he wanted to sue, he sued so many people. Several of our other partners were sued by him. He learned this while young in practice, and he told me once, "This is how we settle things in this country here: we sue them. They don't follow me, I sue them." So he did that.

Finally, he sued a fellow in charge of our Dallas office, in Texas, Ben Young. Not a Chinese, but Y-O-U-N-G, Ben Young.

Swent: In charge of--?

Lin: In charge of T.Y. Lin Associates in Dallas. He threatened to sue him, and this Ben Young came to me and asked me to be a witness. Oh yes, a witness. I said, "Yes." When he thought that if I served as a witness, he would lose the case, Mr. Rice, my good partner, threatened me. Finally he said, "If you are going to serve as witness, I will sue you." I said, "Okay," so he went ahead and sued me for two years. Finally the thing was settled; I think he did not sue Ben Young.

Now, this must be forty years ago now. So last week I got a letter from him; he wanted to come to an alumni meeting this September, and be nice to me. I think finally he woke up. I am not going to bring up the case, but that's what some people do here. When you have money--he's very rich, as I said. He was multi-millionaire, so he sued everybody who did not take his orders. This was the American way. They don't care.

But he is a very capable person and essentially a good person. But he got this idea of suing people.

Swent: What was he suing you for?

Lin: Because he said if I wanted to serve as the witness of this other partner, then he would sue me. I said, "I will," and so he sued me. The case never appeared anywhere, and my case was settled after two years. So that's how things are. Here in this country, we do that.

Now I think he sort of regrets this thing. But it doesn't matter. We get this kind of thing all the time. I have had many lawsuits.

Swent: I'm sure. That's part of doing business, I guess, isn't it?

Lin: Yes.

Swent: It's unfortunate.

Lin: Yes.

The Decision to Concentrate on Prestressed Concrete, to Be Active in the Design of Structures

Swent: Well, let's go back, if we can, a little bit, and I'm sure we'll be going back and forth a lot in these interviews. But I wanted to, before we go any farther, talk more about your getting into this specialty of prestressed concrete. When you began here as a lecturer, and then you became a regular faculty member, prestressed concrete was one of many things that you could have chosen to become interested in. What were some of the options that you had in those early years at Berkeley?

Lin: Well, without going to the other options, I can describe why I went into prestressed concrete. I think the main reason was in prestressed concrete, you pull the wire on a curve or in a straight line, and push it against the concrete. Therefore, you are activating a force. It's an active operation in structural engineering, which enables you to control. As soon as I entered into structural engineering, I always entertained this idea of how to be active in the design and construction of structures. And this enabled me to do that.

But it would not have occurred if not because of the European prestressed concrete experts. I heard three or four of their speakers at Berkeley around 1950, and that primed me to this idea. So the structure is not just a dead structure, make it heavy, make it strong, but to control it. And this enables that control. The whole theory of prestressed concrete from my point of view was developed from the control point of view, which is one step, I'll say, ahead of Freyssinet. He had some control, yes, but I extended this very far.

Swent: As I understand it, prestressed concrete had been used for quite a long time for containment structures, but not for bridges; is that right?

Lin: That's exactly right. For tanks, it was invented maybe twenty, thirty, forty years ago earlier. It was mentioned in my book.

Swent: The old idea of a barrel.

Lin: Exactly. But this now was much further than that. It started from the idea of the barrel.

Swent: Of course, transportation was becoming more important. Highways and bridges were more necessary.

Lin: They all need structures. But to activate the force in the structures by pre-stressing, that's very interesting. I developed the whole theory, and I must say that much of the credit is due to myself. So I express it in that book, the control of those forces. That enables you not only to design a structure by sheer strength, but by acute and effective particulation of forces, by pulling the steel against the concrete.

Swent: Let's talk about some of the people. I guess you never met Freyssinet, did you?

Lin: No. I met his protege, who was Guyon.

Swent: Where did you meet him?

Lin: I met him many times. In Europe, and probably once or twice in this country.

Newtonian Theory Applies to Prestressed Concrete

Swent: Did you learn anything from him?

Lin: No. I think I told you that story. Once he came to Belgium to see my experiment, which was conducted by me under the direction of Professor Magnel, who wanted to dispute a theory which Freyssinet claimed that prestressed concrete is supernatural and cannot be solved by regular mechanics. He, Professor Magnel, and others in Great Britain didn't believe in that. So later I found out that was one reason, maybe the reason, he wanted me to go there and work for him.

So I made experiments under his initiative, oh, I think maybe sixty-foot-long continuous beams, and tested four of them to prove the old theories of mechanics and strength of materials. After this was done, Guyon came to Belgium. It so happened that I was in England to give a talk so did not meet him. But when I went back, Magnel told me Guyon agreed that our experiment perfectly showed that the old theories of mechanics and strength of materials still applied to prestressed concrete, and their fired imagination, which is typically French--imagination is good in a way, it gives you initiative. But when you go scientifically and prove it, then it may not work. To be able to apply the old mechanics to prestressed concrete changed the popular understanding and application of prestressed concrete.

And this is my main contribution, not only this experiment, but from there on in my book, everything was based on the past experience, experiments, and theory, and practice. I showed prestressed concrete was not different, even though it's on a raised level and designed actively.

One other thing that I did have in my book was the use of the compression and tension couple, CT. C is compression in concrete, T is the tension in steel. The CT couple, which was a very old Newton theory, the C compression here, T tension here, form a moment. Starting from that, I extrapolated the design of prestressed concrete into advanced structures which engineers never knew how to do, such as shells, plates, frames, et cetera. When you understood the theory, the basic theory, it was no different from Newton's basic theory of statics, plus of course dynamics, and so forth. That simplified the whole approach.

So I was able to explain prestressed concrete analysis and design in terms of basic Newton and related theories. Whereas the French never did that. That's why my book became so popular, and people credit this to T.Y. Lin, as sort of a father of prestressed concrete.

The Magnel Laboratory, Ghent, Belgium

Swent: Maybe you can go into a little more detail about this experiment that you did for Magnel that was so decisive. What sort of laboratory did he have?

Lin: Oh, he has a very big laboratory, as big as our engineering laboratory here at Berkeley, but especially devoted to prestressed concrete.

Swent: Was this a private or a university--

Lin: It belonged to the University of Ghent. They made it for him, called it Professor Magnel's Laboratory, in honor of him. So he tested in it, and used prestressed concrete in Belgium and other places all the time. Very useful to me, as I said before. I was there for the whole year.

Swent: Did you have any idea when you went what sort of work you would be doing?

Lin: Yes, yes, because I had some idea from other sources.

Swent: How did you come to get the Fulbright fellowship?

Lin: Okay. First I applied for the Fulbright grant.

Swent: Had one of your professors urged you to do this?

Lin: No, no. I think the government has a special office for giving these grants.

Swent: How did you know about it?

Lin: Well, this is pretty well known among the engineering profession, and through the university. But I got it only with the support of fellow engineers with CalTrans.

Swent: You were already known to them, then?

Lin: Yes.

Swent: How did that come about?

Lin: Through--one of the things was the testing of the first prestressed concrete bridge in U.S., in California, known as Arroyo Seco Bridge.

Swent: Had that already been built?

Lin: That was built with my help, by CalTrans, and I ran a whole test on this bridge.

Swent: How did you come to be involved in that?

Lin: Because really through teaching here, I somehow got in touch with the CalTrans engineers. One was Stewart Mitchell, and the other is Panhorst, who was the pioneer of bridge engineering in California, both with CalTrans. These two--somehow through my teaching, I made friends with them. They knew me, so I ran this test at Arroyo Seco Bridge, which showed them my understanding of those things. We had good mutual respect, so when I applied, they made good recommendations, and I got the award to Belgium, to do research for one year. That really was very important for me. 1953 to '54.

Swent: So you were already committed to prestressed concrete as a study by then.

Lin: Yes. I think, as I said again, John Wiley Company asked me in 1952 or '53, "Can you write a textbook?" I didn't imagine of it. But then I did gather materials and wrote the whole book in

Belgium. While in Belgium, I did three things: wrote the book in one year, having gathered the material before that. And took part in all the laboratory tests, and traveled throughout whole Europe. It was a very pleasant year.

Swent: Did you have an editorial assistant for that first book? I noticed Ned Burns assisted with this third edition.

Lin: No. Entirely by myself; my editorial assistant is Margaret. She took care of everything there, and she watched me: "Every day you've got to write ten pages." So we did that for a while anyway.

Ned Burns was my co-author after the first edition. After the first edition went so well, John Wiley said, "It's time to revise it." So they got for me a very capable Ned Burns, who was a very good professor at Texas. So we revised it the second time and the third time. He did most of the revisions. The first one was completely mine, as I said, with Margaret's help. I finished the whole book in one year, and came back and got it published the next year.

Swent: Tell something about Professor Magnel. What sort of person was he?

Lin: He was a real personality. A typical high-class, super professor of Europe. Very confident and proud, and very capable. He also contributed a lot toward prestressed concrete. He also has written a book. His book I think is better than the French one by Guyon. Guyon's is so mathematical, it's become a mathematical book, not an engineering book. His is much better, but still he has not got into the basics of prestressed concrete as I did.

Swent: Had you met him before you went there?

Lin: No, never. He knew of me because I had already designed some buildings and bridges, small ones, and written papers on these. So I was already known through the world, having these papers published in America. So he knew of me, and he took me in to support him, because he knew of my reputation. And as I said, I got the award probably with help of CalTrans good engineers, Panhorst and Mitchell.

Swent: Were you doing any teaching or supervising of students at Ghent?

Lin: No. At Ghent I didn't teach. I did occasionally give lectures. I gave lectures in England, and maybe elsewhere, but not at the University of Ghent.

Swent: You were not on the faculty.

Lin: No. I was what they call a research professor. I did research. I ran a series of tests.

Swent: Did you have student helpers?

Lin: No student helpers; they had a laboratory technician. He's very, very good.

Swent: Have you gone back?

Lin: No. In fact, two years ago, they nominated me for an award. I did apply, but then they gave it to a local architect. Otherwise, I would have been back there.

Swent: What was the very first structure that you ever were involved with that was of prestressed concrete?

Lin: I think the most important one--

Swent: But what was the first? The very first?

Lin: The very first was the Lick Garage right here.

Swent: Oh, yes, you spoke of that last time, and that is still there, you said.

Lin: That was dismantled. Another garage--

Swent: The other one is still there.

Lin: The other garage called Downtown Garage is still there, about nine stories. Then the bridge was the testing of the Arroyo Seco Bridge in Los Angeles. Those were done before I joined Magnel.

Swent: What relation was there with your Chinese experience? Were the bridges that you were building there similar in any way to, for instance, the Lick Garage? What's the connection there?

Lin: Okay, at that time, I did nothing in China or in Taiwan concerning prestressed concrete. There was no industry to support it and no people knew anything about it.

Swent: And you were doing only bridges, weren't you?

Lin: Only bridges, mostly concrete and some steel. Regular bridges, but not prestressed concrete. Not at that time.

Swent: So the thought was not even in your mind at that time?

Lin: No, no. I never heard of prestressed concrete until I came back to Berkeley again, through guest lecturers from Europe.

Swent: Were there problems with those bridges that you thought could be solved when you learned about prestressed concrete?

Lin: Well, every bridge, of course, has its problem, but they were resolved, and never create any real problem. You have to solve a structural problem, not as effectively as using prestressed concrete.

Swent: How did you decide between using concrete or steel?

Lin: Okay, generally, economics and availability of materials and labor and equipment. Usually in a group of bridges, we use both steel and concrete. I was very much for concrete at that time, but later on, having developed prestressed concrete, I also developed prestressed steel, such as the Mississippi River Bridge across the Twin Cities, and the Idaho bridge. But not many following them. I think I did not put enough effort to publicize it, and people in engineering were quite slow anyway. But it has not become a popular thing.

Swent: You did not follow that up.

Lin: Did not follow that. I did do some occasionally, when the occasion comes, but not popularize it.

Swent: And how do you make that kind of decision, between prestressed steel or prestressed concrete?

Lin: Okay, prestressed concrete is clearly more economical, because you have cheap concrete to take the compression; and ductile steel to take the tension. The two just naturally combine. When you have steel which already can take compression or tension, and you put in cable to take more tension, it's effective, but not in as big a way as prestressed concrete; I think that's why.

Now, I think in America, in this country, and probably throughout the world, prestressed concrete occupies about half of the bridges, i.e., 50 percent of all the bridges built during the few decades. The other half is reinforced concrete and steel bridges. That shows the economy, natural economy.

Swent: Let's go back to Taiwan again, or China. Were any of these decisions on bridges political or social? The decision where to build a bridge or what to build it of?

Lin: In the old days, this is more up to the governor, so-called. Whoever governed the place, he would have final say. He would engage an architect or engineer to build a bridge. He may have some ideas, but the architect and/or engineer would do the job by himself. That's in the old days.

Since the introduction of modern industries and technologies, decisions are very much made by the architect or engineer. In the case of bridges, more by the engineer. Unfortunately, engineers were not usually well educated broadly enough to understand the various aspects of engineering or society, I think. I think in this respect, I was a little better trained, having studied poems and other classics when I was really young. I had a broader point of view. And later on, also, having spent one full year in Europe, plus enough time in the U.S.A. and Asia, so I have been sort of trained in a global manner, across the various continents. That has given me a little advantage.

The T.Y. Lin Conference in Beijing, 19 August 1999

Swent: Yes. A bridge is more than just a physical structure, isn't it?

Lin: That's a very important point of view. Nowadays people begin to realize that. I have been trying to work in China. In fact, just this morning came a fax, the premier of China, whose name is Zhu Rong Ji and who is very close to me. I gave him many political advice, so he has great respect for me. He summoned a meeting specially for T.Y. Lin to be held in Beijing this August 19th, a few days from now. This has been arranged for a while. It's called the T.Y. Lin Conference. He asked all the twenty-eight provinces of China and related ministries, each sent one or two delegates to that meeting on August 19th, the T.Y. Lin meeting.

Swent: Oh! And you won't be there.

Lin: I won't be there! So they sent this, "T.Y. Lin, you must come!" But I cannot come because I have this high sugar--diabetes problem, and my knees are not that damn strong [hitting his knees]. So I won't go. In fact, he was here in Los Angeles, wanted to see me very much; I didn't go. So I asked my partner, Y.C. Yang, to go. This time, I again asked Y.C. Yang to go to that big meeting on the 19th. The whole country has sent engineers to listen to the talks. But I have prepared a video, so I will talk for about an hour through the video.

Swent: In Chinese?

Lin: In Chinese. In fact, I have written this paper which is upstairs, very interesting. I'll show you in a while, I'll take it down and show you. My topic is "Creativity in Engineering to Help National Construction."

##

Swent: You said that you have been working in China for about ten years now.

Lin: About ten years, and without much success. It's very difficult because of the conditions they are in and the system they have. I was not and am not well acquainted; didn't understand it. Fortunately, the premier is my good friend, so he asked me to visit; it's fun to go there; it's very interesting. [shows pictures which accompany his paper]

Swent: Oh, that's lovely. That's the Ruck-a-Chucky Bridge?

Lin: That's the Ruck-a-Chucky, yes. And there's some on the inside. Look at the pictures.

Swent: That's a beautiful picture of the bridge. How do you do this? Do you have a Chinese typewriter?

Lin: My secretary in San Francisco, she does that.

Swent: Does she do this by hand?

Lin: No, she types all this. These are computers--they all came on a computer.

Swent: Oh, these are beautiful. Now, which bridge is this?

Lin: That's the China bridge, very old bridge that I designed and built. And this I built later in Taiwan. Compare the two. This is very, very old; this is very, very new.

Swent: But similar designs. Now, this is the Republic of China stamp that shows this bridge. What's the name of that bridge?

Lin: Kuan Du Bridge. I should get you a copy of these later. This shows my testing of a prestressed concrete slab at Berkeley, the university.

These Caracas grandstand roofs stick out ninety feet with three-inch thin shell. I did it! It's still there now over forty years. Very interesting, and this is how it looks, three inch thin! Three-inch concrete. Goes here thirty-three feet and continues here ninety feet. Even now, people cannot repeat this.

Swent: Yes, with almost no supports.

Lin: Right, almost no supports. And this is the Moscone Center. And this is in Malaysia, one thousand feet roof, the world record. One thousand feet with two half moons. Now that's the one that failed. Everything else collapsed, and my building is still there.

Swent: And that is where?

Lin: This is Managua, Nicaragua. That's very well known. All other buildings collapsed.

Swent: At the time of the earthquake.

Lin: Earthquake, it was 1973.

Swent: And your building stood.

Lin: Stood.

Swent: I've seen that.

Lin: You've seen that. And this one is in Taiwan, eighty-eight stories. And this is Emeryville, thirty-story concrete frame building. Each of them is a long, long story to tell. When the time comes, we'll do that.

Swent: We will do that, yes.

Lin: See, and this one sleeps on the volcano mountainside in Philippines. The owner wanted to build a highrise building on this hillside for this highrise. The tie-back in the foundations will cost them too much, say $50 million. They couldn't afford to build it. I said, "Don't build this." Let it sleep here.

Swent: Let it sleep?

Lin: Sleep! [gestures] See, so this whole thing is sleeping on the hillside.

Swent: It's just a reclining building.

Lin: Reclining building, and this saved them $50 million, and they built it three years ago. Immediately, every condo was sold right away.

Swent: It's beautiful.

Lin: So every one of these is very interesting, but we'll just thumb over now, okay. And here this whole thing is built from the top down, the Rio Colorado inverted arch in Costa Rica. And this is the Mississippi River arch where we have many columns but for this Bitan arch in Taiwan, I took off all the columns for a very good reason. We curved the cable in the deck to hold it up. This next one was built in Singapore.

And then I met with the president of PRC and I proposed a stepped change from communism into democracy. It's a good story, very interesting. That's the Shanghai Bridge. And then this one is from Ohio; they built it in Shanghai. Premier Zhu Rong Ji took this picture back to China, and they built a similar one.

The Peace Bridge. There's President Reagan. He gave me the Science Medal; I gave him this proposal. And here is the Gibraltar Bridge. So this paper is being presented on the 19th of August, 1999.

Swent: I'm sorry you can't be there to present it. That is too bad.

Lin: They asked, "Could you please come?" Sorry, my health doesn't permit.

Swent: Just can't do it. Well, you'll be there in spirit, anyway.

Lin: Yes. [laughter] Every one of those things take a long story to tell.

Swent: We want to do that.

Lin: We'll see how we can do that. But we can't do very much anyway.

Swent: We have to talk at some point about earthquakes, and the importance of taking earthquakes into account. You were just talking about creativity and the fact that your classical education gave you an extra dimension. Good engineers have to be more than just mechanics.

Lin: I think that's very, very important, but unfortunately, in our technological world, engineers are only interested in technology. Most of them. The outstanding ones, of course, always go outside, beyond that.

Swent: So your year with Magnel was very fruitful for you, and then you came back to Berkeley and picked up where you had left off. Or did you find it was very different when you came back?

Lin: No, after just one year away, not too much difference back in U.S.A. But I came back with a lot of ideas which I learned from Europe, and that helped me.

Swent: Did you? What were they?

Lin: Essentially along the lines of prestressed concrete. I did not learn much beyond that, but learned a lot of general things in Europe.

Swent: What were you teaching by now at Berkeley?

Lin: Berkeley, Department of Civil Engineering. Later on, I was asked to be the chairman of structural engineering, and head of the laboratory for a number of years. But meanwhile, I also maintained this practice which we mentioned last time, this practice of outside consulting.

Swent: How did that fit in with your university work?

Lin: This is very important, because Berkeley has a rule that you can do any outside work provided you do not neglect teaching and research duties, which I maintained very well. I worked probably a total of sixty hours a week, and carried out university duties, including director of laboratory and chairman of department, and teaching, conducting research--all of that, at the same time I had this outside office.

This outside office, which we'll talk about another day, but what I did not mention was that I set it up in Los Angeles. That's Mr. Rice, the one who was in charge of it. He is very able. He could get all the projects and manage them, but all the technical things were supplied by me as one person. Nobody understood prestressed concrete, even though I wrote a book, no one had used it yet. Now, the book is used all over the world, especially in this country. They all practice it now. But at that time, I was the only one who could do it.

World Conference on Prestressed Concrete, 1957

Swent: How did this World Conference come about?

Lin: Okay, let's go to that World Conference. Now, to pioneer a new technology like prestressed concrete required many things. You have to come up with new ideas, new formulas, new analysis, design; you've got to prove your thinking, by laboratory tests, and then you've got to build actual buildings to show that it can be done in full size.

Now, actually, the most difficult part is to do the actual real structures. That requires good relation with the outside world. We'll get into that--

Swent: And with people.

Lin: With people, and groups of people. All kinds of rules and laws and everything. We have briefly mentioned. But now we'll concentrate today on the so-called World Conference on Prestressed Concrete.

I had this idea when I was in Belgium. I said, We've got to popularize, let people, educators and students, know about prestressed concrete. At that time, MIT had arranged one, probably called International Congress on Prestressed Concrete, about five or seven years before. I thought we would do one at Berkeley. The idea initiated while I was in Europe. When I came back in 1954, I proceeded on that, and we did a small number of bridges and buildings, wrote some papers and so forth. I was reasonably well known, so when I organized this conference, 1957, there's a great opportunity, but I didn't know it really gave me a big name throughout the world, this conference.

Swent: Did you have to get permission from the university? How did you go about organizing this?

Lin: Oh, yes. The very important part was the support from the university. This will give the university a place as well as myself in this new technology. So I arranged with the university and with the scholarly and professional organizations--American Concrete Institute, American Prestressed Concrete Institute, American Society of Civil Engineers, and so forth. I got all these people together, but using the university as the basis. The university really assigned its extension department to help me. So I had all the dictation and everything else done by my own department as well as the University Extension, sent out invitations and organized the whole thing. Took me about one or two years to get this done.

Swent: Was there anybody who didn't want you to do this?

Lin: No. No, no. Everybody was agreeable. Clearly, my purpose is to advance technology, and so to make the university known; indirectly, myself. I didn't know that much, but later on I found out it's very profitable to myself also.

Now, I organized a conference committee here. I think something like eight or ten people, professors and outside people. Professor Gerwick, Professor Scordelis were members of the committee. Later, Professor Scordelis played an important part in the design and analysis of a number of roof structures.

The conference site chosen was Fairmont Hotel in San Francisco. Number of attendants: 1,200. Including some ladies. Now, twenty-seven countries participated, including Russia. I invited Russia because I did meet some of them while in Europe. They sent five representatives to that conference. And while we were having the conference, November 1957, Russia shot up the Sputnik. It was exactly at the time we had the conference. People were amazed that Russia could do that. The Russians were quite proud.

Their prestressed concrete was okay, but so-so. They extended a reciprocal invitation for me to organize a group to visit Russia. You know, this was very interesting. Now, thinking back, it was something like the ping-pong game which China played with America before Nixon recognized China. Later this trip to Russia was known to be the first National Science Foundation sponsored visit to Russia. I was the leader of this group and I organized a group for the visit.

There was a report, which you must have seen in the library.

Swent: This was in your papers in that box at the university. A report--this is May 1958—"A Report on the Visit of an American Delegation to Observe Concrete and Prestressed Concrete Engineering in the USSR, published for the American delegation by the Portland Cement Association in Chicago."

Lin: You see, I had the support of industry also.

Swent: The conference was in July '57 in San Francisco, and then your visit to--

Lin: To Moscow and Leningrad, essentially.

Swent: The third international congress on prestressing was to be held in Berlin, Germany, in May '58, and then your visit followed that.

Lin: Ah!

Swent: So it was in May '58. You arrived in Moscow on May 11. There were six Americans.

Lin: Yes, yes. I think seven--but anyway.

Swent: Well, Walter Price, James Piper--

Lin: They were the president of American Concrete Institute and vice president of PCA.

Swent: Yes. And Ben Gerwick, of course, was from here. And Billington?

Lin: Billington was the youngest member--he's very well known now--from Princeton. He's a professor there now. But at that time, he was a young fellow.

Swent: So first you attended this conference in Berlin?

Lin: Yes.

Swent: Was that a follow-up of the one at MIT?

Lin: No, no. MIT was about six years before. I arranged the San Francisco conference in 1957--

Swent: Now, one was called a congress and one was called--

Lin: Yes, yes, whatever. So the world conference was held in San Francisco in '57. Then I began arranging the visit to Russia, and make it coinciding with the FIP conference.

Swent: In Berlin.

Lin: So that's '58. A lot of fun. So Margaret went there, and we had some very good dances at the banquet.

Swent: Oh, I'm sure.

Lin: One of the professors, Rene Walther, who danced with Margaret at that time--he's also very well known now--wrote us a letter just last year.

So we went through Germany into Russia. Now, let me finish the conference first, and then we'll go to that Russian visit. The conference in San Francisco, as I stated, had about 1,200 attendants from twenty-seven countries and papers were presented for about three or four days. They were published in the world conference proceedings on prestressed concrete, which the library has a copy. Very thick volume, with papers from various authorities throughout the world.

Swent: Did you give a paper?

Lin: Yes. I gave the concluding paper, which included a parody of Shakespeare.

Swent: That's when you did your famous parody of Shakespeare?

Lin: [laughs] Yes. I think that was very interesting.

Swent: Yes, it's lovely. Would you like to read that?

Lin: I think I'll read that for the record.

Swent: Yes. You are reading, this is now from the introduction of the third edition.

Lin: Actually, this was read at the conference, and it was published in the proceedings. Then when my book came out, I asked it to be included here.

Swent: This is the parody of Shakespeare.

Lin: I had a little bit of Shakespeare, I read all of Shakespeare. One book has some twenty of Shakespeare's plays. So I knew a little bit about Shakespeare. This is "As You Like It," I believe. I figure out what Shakespeare described, the change from youth to age in seven stages. And these can be applied to prestressed concrete, as well as many other developments of technology. It reads as follows. This is 1957, parody of Shakespeare:

"All the world is a stage, and all engineering techniques merely players. They have their exits and their entrances. Prestressed concrete, like others, plays a part. It has seven ages. At first, the infant, stressing and compressing in the inventor's arms. Then the curious schoolboy, fondly created by imaginative engineers for wealthy customers. Successfully built but costs a lot of dough. Then the lover, whose course never runs smooth, embraced by some and shunned by others, especially building officials. Now the soldier produce en masse the world over, quick to fight against any material, not only in strength but in economy as well. Soon the justice, code and specifications set up to abide. Formulas and tables to help you decide. No more fun to the pioneers. But so prestressed concrete plays its part.

"The sixth age turned to refine research, and yet bolder design, undreamed of by predecessors and men in ivory towers. Last event of all, in common use, and in oblivion. This eventful history of prestressed concrete, as one of engineering methods, and materials. Like timber, like steel, like reinforced concrete, like everything else." [laughs--brings tears]

Swent: That is wonderful, it really is. Beautiful.

Lin: It makes me choke. I remember how I did this kind of thing!

Swent: You're the only one that can do that. That's very special, it truly is. You have a much larger vision than most people.

Lin: And see, what's very interesting, it's all true. The first part was played already, like every other material. A big fight to promote, to research, and to construct prestressed concrete; we can compare it with reinforced concrete, with steel, with timber, and so on and so forth. That's how the whole story goes.

Swent: What stage were you in then?

Lin: About the fourth. Now it's all very refined.

Swent: Now it's in the last stage, maybe? Accepted by everybody.

Lin: Like everything else. [laughs]

The Berlin Conference on Prestressed Concrete, 1958

Lin: So the world conference, which was followed by the Berlin meeting, of the International Association for Prestressing. That's the international organization. After the Berlin conference, we went into Russia. Now, while in Berlin, I sort of led my delegates, about eight of them, including two wives, Margaret and Mrs. Fleur Piper. So we're in Berlin, ready to get into Russia. The next day after the congress in Berlin, we went to the East Berlin airport. A day before that, one of my delegates was taken by the German communists and put in sort of a jail, because he was trying to take a picture of a camp which has red flags all over it. He didn't know that's forbidden.

Swent: A picture of what?

Lin: Of a camp, you know, soldiers. He didn't know it was a camp. It had red flags all over it. He was caught. We thought the next day we might not be able to go, but fortunately, we negotiated, and after one day he was released.

The next day we went to the airport, and they checked in everyone except T.Y. Lin. They said, "Oh, we do not have your name on the list." Then Professor [Boris] Bresler and Gerwick got mad. "He's our leader! Without him how we go to Russia?" So we fought and argued for quite a while. Then Professor Bresler slipped a fifty dollar bill to one of them, they took the money, and said, "Okay." That's how things could happen.

Of course, we had this kind of experience when entering Hanoi to Kunming, had the same thing. The French guards and the Chinese did the same thing. Sometimes, fifty dollars solve the whole problem! Of course the day ahead, we registered everybody's name. Of course my name was there. But they would not allow me in. [laughs] Fifty dollars did the trick, you see? That's the trouble of the communist world. But of course, in the colonial world we also had this kind of thing sometimes.

Swent: Did they examine your luggage very carefully?

Lin: Okay, yes. Actually, we got in the Berlin airport, flying Russian airline to Moscow. When we got into Moscow, they receive us at the airport in a big room, much bigger than this. There were probably twenty, thirty people welcoming us. So we sat around a long table. I look around, and most of them did not look like engineers. They looked like KGB. You could see they got scars on their faces, and the way they acted. We sat there with the real host as well as these other people for about two hours, and then they say, "Your luggage is ready." You know what that means, you see?

The Russian Conference on Concrete Engineering, 1958

Swent: They were going through your luggage.

Lin: They were going through it for two hours. But we didn't bring anything, and so we're in.

Now, we were supposed to be housed in a big hotel, the best hotel in Moscow, but that day, another delegation from some country, I cannot remember what, came, and they occupied that, so we were put in a second hotel. But that's okay. We were treated well in Russia, in Moscow. And one day, driving from the hotel to the meeting, there was a car wreck, and my host, whose name was Skramtaev, he was very frightened. He thought my car could be in trouble, in which case he would be in trouble. Fortunately it was some other car having a small wreck.

So we were there. Let me think of one story. Yes. So they treated us for, I don't know, three or four, five days, in Moscow. The last day, we returned that--

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Swent: So the Russians entertained you for a few days, and then your last night you entertained them?

Lin: Yes. So we prepared among our delegates, a total of, I cannot remember, maybe a thousand dollars or even a few thousand dollars, for the banquet. That morning, our host, Skramtaev, came secretly to my room and he pulled out of his pocket a bunch of Russian rubles, equivalent to that banquet. I think it was worth a few thousand dollars. He presented to me. He said, "We cannot let you pay. So please take this money." I immediately accepted. It's very interesting.

Then after he left, I talked with Gerwick and my American friends, and they said, "Why did you accept it?" I said, if they make such an offer, you don't accept it, they are like Orientals who'd consider it losing face. I had that experience in China. If they offer you something, you can't refuse it. That means you're looking down upon us. [mumbles] Any way we got on very well.

It's this kind of thing that I got along with the Russians and won their heart. Now, going back the year before, all arrangements were quite secretive with the group of Russians. They couldn't see this, couldn't see that, and all kinds of things. But I handled them very well, somehow. Smoothed them off and took them off, and the Russians cannot go to see Gerwick's plant, for example. But we arranged for them to see it somehow. We had our people, CIA, for example. They've got to play their part. We arranged, so nobody was conscious of these things, and got over it.

Swent: What was so special about Gerwick's plant?

Lin: No, I was just using this as an example. I can't remember which one they said cannot go. I think it was the airport nearby. Our people had to protect their duties, you see? So when we went to Russia, the same thing probably happened.

Swent: Yes. What were you doing in Russia? It says "to observe concrete and prestressed concrete engineering." Were you visiting, looking at bridges, structures?

Lin: Yes, yes. It's described in that report. Bridges and buildings and plants, usually it's plants, which produced prestressed concrete.

Swent: I see. And were they--how were they about letting you see things?

Lin: Well, these things were completely open. There's nothing secret, you know, in engineering, there's none of it. Yes, I think they let us see all we could. They may have something that was secret, but we never saw. We were not aware that anything in the area of prestressed concrete could be secret, you know. We published--they also published it in all papers. But often times, as I said, these people, they have their duties.

Swent: In the hotel, were you observed? Did you have bugs in your room, did you think, or something like that?

Lin: No.

Swent: The lady on the floor that took your key?

Lin: We were told, Bob Hope said, looking into the TV, watch out, "it may be looking at you." [laughs] We were not aware, but I think there were occasions--such as when we arrived, the baggage was detained for two hours.

A Strange Visit from Cousin Professor Li

Lin: And then, while in Moscow, one of my cousins, Professor Li from China, was there. One day when I was out, he came to the hotel and introduced himself to Margaret. Margaret didn't know what his intention was; never met him before, in fact. So Margaret was very scared. But we handled it all right.

Then, after maybe thirty years, we went to Beijing, and this cousin came back already to China. He came to us again and said, "T.Y., Margaret, do you know? I was asked by the Chinese government to try to get you to defect U.S.A. and come back to China."

Swent: Oh, really?

Lin: [growl] But he never did. He never even conveyed the word. It's impossible. But after thirty years, he said, "I was asked to do that."

Swent: That's why he was there in Moscow?

Lin: No, he was there for a technical stay, I think. Margaret made an interesting story of his visit. But this kind of thing happens--I just took it for granted. Whatever they do, that's their business. What happens next, we're talking of Russia. Yes.

After this visit, I cemented a good relationship with the Russian people. Of course, as a result of which, I started the peace bridge across Bering Strait. That is a story to be told later.

Swent: These Russian people that you were meeting, were they also university people?

Lin: Yes, some professors.

Swent: And practicing engineers?

Lin: And practicing, and researchers, and consultants or whatever. But not in private business.

Swent: How did you feel about their technical competence? Were you able to evaluate that?

Lin: At that time, in prestressed concrete, they were a little bit ahead of us.

Swent: Were they?

Lin: Yes, because it just happened that these two professors sort of pioneered prestressed concrete in Russia, and we here were just beginning. Europe was ahead of Russia, but Russia was perhaps in certain ways ahead of us at that time. Not that much; we caught up very easily, very easily.

So as a result, we completed our trip, and came back. The next year and the year after, for three or four years, Russia kept sending over their people to revisit America. The State Department trusted me well enough to let me entertain them every time the Russians came. And the Russians trust me too. I am a straight person, I don't care.

A Story About the CIA

Lin: Well, there is one story I could tell you, how we, our CIA worked. But you put this in quotes if you wish.

Swent: All right.

Lin: When I went to Berlin, they contacted me before, of course. They said, "T.Y., when you get to Berlin, before going into Russia, we would have a delegate there visit you, and you will meet him on a certain street," Unter den Linden or whatever. And he would carry a copy of the latest Time magazine to identify himself. Then I did, at that hour, at that day, at the right place, saw an American coming along carrying a Time magazine. So we went into a huddle. He was very, very nice, nothing like the KGB--he just wanted to make the contacts. I think.

Now, they might want to check, "Is T.Y. Lin a double spy," for China or whatever. [laughs] I don't think they had much doubt, but they want to be sure. So they wanted to look me over. But I always was so straightforward, I raised no doubt whatever. So that's an interesting occasion for me.

Swent: Very, yes.

Lin: And after that, two or three years, back from Russia, Russians revisited us. And every time they come to San Francisco, the State Department called me up, and let me entertain them.

Swent: How did you entertain them?

Lin: Okay. I entertained them by--oh, getting cars and driving and showing them around. There was the head of the delegation, a Russian vice premier, Kucherenko, however you spell it. So I took him across the Golden Gate Bridge into Marin County, and he asked to see an American motel. So I brought him just into one of the motels, a relatively nice one, to look into the rooms. He told his translator, "Tell Professor Lin I will move in here any time." [laughter] Even the plastic chairs seemed so nice. It's nothing special here, but to them, you see. Because under the communist system, clearly they had this lack of materials, because they did not encourage private people to produce and use this material. So I saw all those things. Very interesting.

They all became very good friends, and I took them through San Francisco and showed them various things.

Swent: Did you bring them to your home?

Lin: Let me try to think. Where was I at that time? I don't think I moved here yet. Yes, I was not here yet, so my home was down below in Berkeley. I don't think I did take them there. I took them to lots of places, and they became very friendly with me. What interesting places--I can't remember. So many interesting visits where they make certain remarks, et cetera.

Swent: Did you ever do any student exchanges?

Lin: No, because of the language problem. I don't think their teaching is quite as good as in this country. Even their university--it's a high-class university--even Belgium has a high-class university, but their professors and other things were not as good at this. Specifically, the prestressed concrete laboratory was a very good one at that time. But soon, we came back and built our laboratory, at UC Berkeley, and that's even ahead of theirs. In Russia, they had something, though not that advanced.

Swent: Did you go back to Russia again?

Lin: Let me think. I think I did. Oh, we once went on a trip, a cruise, we landed in that port, Leningrad, and revisited it.

Swent: What about the other end of Russia? Did you get over to Siberia at that time?

Lin: Yes, also on a cruise, but never landed. Never landed.

The Concept of the Peace Bridge Across the Bering Strait

Swent: When did the idea of the Peace Bridge begin to occur to you?

Lin: Okay. The idea of the Peace Bridge actually resulted from this trip to Russia. I finally discovered Russians, Americans, Chinese, they're all the same. I handled them like good, regular people, and they handled me well too--there's no problem. But why this cold war going on? I couldn't understand that. So I made up my mind to contribute toward better understanding between these peoples, I started the Peace Bridge.

Swent: You were in a unique position.

Lin: Very unique position to do that thing. With a scientific background, people wouldn't doubt that I could be a spy. [laughs] I cannot do spy work anyway. But I do have an understanding that people are all the same. So this started the Peace Bridge. When I came back from Russia, I started this, and studied the problem and so forth.

There was Senator Magnuson, Warren Magnuson, of Washington. Somehow he learned of my ideas. He liked this. So he helped me sponsor this. He stated, What do you think if we build this bridge, with our kids driving across the bridge to Russia? And they'll be very welcome there. This will help us better improve our relationship.

Swent: That was a time when--as you said, the Sputnik was in July of '57.

Lin: Yes, when we had the meeting. That's when we had it.

Swent: There was a great deal of interest at that time in that Bering Strait area.

Lin: I went to Alaska several times.

Swent: [consulting notes] Alaska entered the union formally January 3, 1959; that was when Alaska became a state.

Lin: Very close, very close, only two years after that. Ahhhh!

Swent: And Magnuson, of course, from Washington, was instrumental in all of that.

Lin: Ahhhhh, very interesting. You know history, we thought World War II would end all wars. Has not. Probably end all world wars, but other wars are continuing. People cannot learn from that. We are used to the old ways of, "I have the strength, I have the soldiers who kill, dominate, who conquer." I had here a story of George Washington. He said, "I am establishing here a new country, with new methods of government never known before." So-called freedom, democracy, et cetera. We thought this here should be nationwide, continent-wide, and worldwide, but not there. No, I think we've got the only country--even we are not perfect, but at least we are going along that line. Europe had some old vestiges of the tyranny. But still, it's coming along.

Asia is still quite far from it. It takes a long time. I thought it would come soon, but they still haven't got it. [laughs]

Swent: It's very slow.

Lin: Very slow, very slow. But anyway, we have a good life here, when you look at Mongolia. [laughter]

Swent: Right! So you started the Peace Bridge idea as a result of this trip, then, to Russia.

Lin: Yes. Shall we go on with the Peace Bridge or go with something else?

Swent: Well, what would you like--perhaps since we're talking about it, the Peace Bridge? It's up to you.

Lin: It's too long. The technical part--we'd better do that later, the peace bridge later. What do you have here? [consulting outline]

Swent: We don't have to stick to this exactly.

Lin: So very briefly, in fact--there are so many interesting things here, get in touch with Russia.

Swent: We don't have to--we can do it all. We don't have to worry.

Lin: Oh, still time.

Swent: There's still time, yes.

Lin: Maybe we'll try to finish the bridge.

Swent: All right, let's talk about that.

Lin: All right. The Bering Strait Bridge, I got some idea from an engineering point of view, how to build it. So I looked into the historical development, and found out there were several proposals to bridge the Bering Strait.

Swent: How wide is it? What is the distance?

Lin: It's about fifty miles.

Swent: And there's shallow water--

Lin: The beautiful thing is, the water is very shallow. When I say very shallow, it's about fifty meters all the way, apparently due to the ice-age glacier going through that strait. So they carved out, smoothed out, a flat area, generally with rock, maybe gravels. And that, using modern construction technology, can be done very simply by making reproductions of bridge elements. So I envisioned to produce about two hundred piers to be sunk into the bottom. Since the water is uniformly fifty meters deep throughout, I can sink these easily. Fifty meters is not very deep. Now oil drilling platforms go five hundred meters or more. Fifty meters was considered deep for a bridge pier, but very short if you look at it from oil drilling platform and other point of view.

Okay, suppose we have about two hundred piers, prefabricated in a factory nearby somewhere. A factory could produce five, ten piers every month, and set up these piers. The superstructure would be about one thousand feet each, and I figured would be 1200 feet, after many studies. Each one will be a double cantilever deck, all prefabricated in a factory. Floated out into the site and sat on top of the piers.

So this fifty miles bridge can be built mechanically with a good easy pattern. I make an estimate, and so forth.

It did not cost that much. At that time, I think I had something like $4 billion. That's about forty years ago. Now, it probably would be $20 billion. And when you compare this to the amount of money we use in armament, we're talking of $500 billion a year at that time. Russia was spending hundreds of billions, and America too. So every year, if we stop the armaments, we could build 100 of those bridges. But people are funny. They spend these things fighting each other and not trying to connect with each other.

So this proposal became quite popular. It appeared in *Popular Mechanics* during the last three decades, three times on the front page! That indicates how much our people really like peace. And it is published in Russian papers several times, too.

I figured out, to do this, I should establish a foundation. So I asked for an Intercontinental Peace Bridge Foundation to be set up, incorporated and approved by the IRS to get tax-free money. That was about 1960-some. I applied through Martinez, the county seat [of Contra Costa County]. The next day, I got a call from a newspaper. "We understand you are setting up a peace bridge corporation." "How come you know it?" "We have regular people checking Martinez." All the county seats, you know, and they found it out. So I told him the purpose, and it went throughout the world! All the world soon knew a peace bridge corporation is being established. So that eventually led to all other papers publishing it.

One interesting paper was in South Africa, Johannesburg. They have a concrete society which liked this concrete bridge to be built, so they sent me a request, I sent them material, and they published a beautiful article with good pictures. Can you imagine, down south, Johannesburg, their concrete society publicized this thing!

Yes, look at this--that's their picture. [points to illustration in paper for 8/19/99] They have a whole article, see? Showing the world, the hemispheres, and the bridge.

Swent: So they were excited about it too.

Lin: They were excited--all the world, everywhere. And this is one of the front pages in *Popular Mechanics*. Three times! That indicates people really want peace. And in fact, yesterday someone gave me something in Chinese naming ten projects for the coming century, which includes the Peace Bridge. I didn't know that. Only yesterday I saw this. People have this longing for peace. But do you know our people are well-to-do now; one main reason was having a peace with Russia. Otherwise, we'll be building these nuclear rockets and everything for no reason. We've got thousands of these missiles. Russia has thousands of these. Now, they cannot even dispose of them. If we had really spent these on Peace Bridge, wouldn't that be something.

And then I also made contact with oil people, oil companies. They want to eventually transport oil and gas from Siberia to California via this bridge. Now then, the bridge's reason for existence was political--to make peace--and now it becomes economic. In fact, if we have some really daring emperor and build this bridge for $20 billion, so what? Of course, it also requires highways leading to it along both sides, which would cost another $20 or $40 billion. But how can we direct our energy toward connecting people together instead of separating us apart?

Now I have established this Peace Bridge Foundation, or Corporation--for about forty years. I am going to get it dissolved, because now I cannot do very much. But previously, my purpose was political. It has served its purpose in a small way.

Swent: I think it has.

Lin: In a small way. The Russian people responded to that, and Reagan, since I did give him this thing here [refers to photograph with President Reagan], and he did eventually make peace with Russia. For whatever amount this has contributed, it's worthwhile. But now this is an economic issue.

Look at the trouble we have in Palestine, Palestinians and Jewish people, fight over this tiny land. Irish and English, again fighting for religious reasons. However, the religious reasons you cannot solve yet. We got to work together. But people just don't think that way yet.

So the bridge is still a dream, but just to think of it has helped a lot.

Now, since my idea of making the bridges with prefabricated piers supporting prefabricated decks, one piece at a time, maybe 1,000 foot long, some bridges have been built like that: the Pamana Bridge in Pakistan, and the Prince Edward Island in Canada.

##

Lin: Wait a minute, a fax is coming. [pause, tape interruption]

About ten years ago, I attended a conference in Norway on the subject of strait crossings. They announced that T.Y. Lin was the first one to get the idea of strait crossings, by initiating this Bering Strait Bridge. Now we have strait crossings all over the world, long bridges. I think the world has developed to a point where long bridges are economically feasible. It's being considered more and more. And this idea of prefabricating cuts the price down, way, way down.

Swent: And the Bering Bridge, the dream, of course, was to transport both people and oil. How would the oil be transported? Would there be a pipe on the bridge?

Lin: Yes. There will be pipes. Both gas and oil can be transported with pipes.

Swent: So the bridge would be the support for the pipes.

Lin: Yes, yes. See, this one shows [showing picture] pipes down here, railway here, highway here in good weather; in winter, auto would piggy-back ride on the railway. That's a big bridge to accommodate all those things.

Swent: Has this ever been done?

Lin: Things like that. Our Bay Bridge is in a way like that, but not that big. This kind of thing now has to be economically justified, but I think people don't understand economics. You have to put in so much capital, determine the source of gas and oil, and you build a highway or railway to this bridge. The bridge itself becomes only a small part of the total cost. But would people really need the gas and oil? That depends on the time. So now I think the thing will wait.

Swent: There is so much more to it than just the piers of the bridge.

Lin: Right, right. It's really the people. If people have the desire to get together, to understand each other. We thought the European civilization is a very modern one. But it still retains some of the old ideas, particularly religious and other feelings too, against each other. They still want to fight.

Swent: Barriers.

Lin: I think China should be able to contribute a little to that, but this takes time. Chinese do not have that much religion as the

Westerners. Westerners are getting away from it too. Religion is very good in many ways, but it's also bad in others.

Swent: So you're introducing this peace bridge idea again in your speech on the 19th.

Lin: Well, this is one of the many things I mention to them. To make a video of my talk, which we have done, took me six trials, because sometimes my voice is not right, sometimes the machine is wrong. Now I've got it done, it's okay, about one-hour video.

Swent: Good. Who made the video?

Lin: Some cameramen and so forth.

Swent: Did they come here?

Lin: They came here one day, yes. Also in the office, but more in the office.

Swent: Our dancer has come back. How was your dance lesson?

M. Lin: Fine. [laughs]

Swent: Good.

Lin: You know, we spent about $7,000 making that video. I had to pay it myself.

Swent: How is your--is your Chinese--is there any difference from the way they are speaking now in China?

Lin: Not too much difference.

Swent: It hasn't changed that much?

Lin: Some items, that's all, but generally, yes, the same.

Swent: And do you and your wife speak Chinese together?

Lin: Yes.

Swent: So you've kept up your Chinese fluency.

Lin: Oh, yes.

Swent: How about your children? Do they speak Chinese?

Lin: Verna does. She went to Beijing and taught at Tsing Hua University, taught English and learned Chinese. But Paul does not know much.

Swent: So when your family is all together, you speak English.

Lin: Yes. Some Chinese. Margaret speaks more Chinese. Let me see now where we are.

Swent: Well, we do need to talk in detail about these specific bridges, but perhaps it's a little late to start that now. We have a little time; let's talk a little more about the university and your colleagues at the university. Where does structural engineering fit in; what's the difference between structural and civil engineering, for instance?

Lin: Okay. Civil engineering is a general name which I think was devised many centuries ago, two or three centuries ago, as an opposite to military engineering. At that time, there was military engineering--you know, to build a bridge over rivers during fighting. Then started civil engineering. And now, civil engineering has branched out into several subcategories, one of which is structural engineering, which embraces bridges, buildings, anything having to do with structures.

Another one used to be called sanitary engineering, having to do with water and so forth.

Swent: Now, at the same time, I know because of another oral history that I did, that geology was getting into geologic engineering as a result of their interest in seismology and earthquakes and so on. Was earthquake risk and seismology coming into structural engineering at this time?

Lin: Yes and no. Yes, I'll say. Structural engineering now, we begin to understand more about earthquakes, so the seismic part of it, to design against earthquakes, becomes a specialty, and that's usually under structural engineering. But things have been branching out and changing all the time. Of course, there's transportation engineering.

Swent: And of course, bridges incorporate all of these things, don't they?

Lin: In a way, yes.

Swent: You have to think of transportation and hydraulics too, of course.

Lin: Hydraulic engineering too, yes. Very important.

Swent: It's very broad. You mentioned the Tang Shan earthquake, and of course, the San Francisco earthquake, and there was the Long Beach earthquake in the thirties. I don't know how much of an effect that had on people here in northern California, as far as engineering thinking goes.

Lin: I think people know more about how to design against earthquake failures and so forth, but still, we're not there. We cannot predict the time and the place and the magnitude, and the effect of earthquakes. Not yet. We're getting better and better.

Swent: Well, when we talk about your Managua building, we'll get into that a little more.

Lin: All right.

Swent: Let's talk about your relations with other faculty members in the engineering department, then.

Lin: I think my relations with them are very, very great. In spite of the fact that I did work outside. I did perform my university duties, and my outside work seemed even to help my teaching, so I can teach to my students some of the latest developments seen in prestressed concrete. So that maintained a good relation with them. Professors are good people. They're easy to get along, so I get on with most of them. Even all, I think. Yes.

Swent: Did you have any students that you were particularly connected with who later joined you in your firm?

Lin: Yes, in my practice, of course there's Edward Rice, and later succeeding him is Felix Kulka from UCLA, also took my courses, and then Dr. Albert Akl, another of my doctoral students. And there is Sam Zundelevich in Mexico, another student. Yes, I get along with people, students, professors, quite well.

Now, how? I think I understand people. Whenever someone told me of their idea or their practice, which can be entirely different from mine, I can understand it. So one of my friends told me, "T.Y., you have this trouble. If one people tell you go this way, second one that way, third one this way, you always follow the last one." Because they're all reasonable! I hear the first one, oh, that's quite good. Second one, oh; third one, oh, that's good. They're all good to me. I understand very well. And the result is that I don't make the decision that well; if I have three people telling me three things, they're all good. [laughs] And that's bad, you know?

But I do make friends this way, because I understand them very fast.

Swent: Do you make decisions quickly?

Lin: Generally make decisions rather quickly, and occasionally not right, but engineering-wise, I'm quite okay, because I've seen so many things, so I made many decisions, sometimes wrong. I cannot remember, but I'm sure there must have been some times making a decision that's wrong. But generally, make quite good decisions, and quite fast. Which is not good, but as I said, they seem to work generally.

Swent: How did you choose graduate students?

Lin: I don't choose them, they choose me.

Swent: Do you have any that you particularly remember?

Lin: Well, I mentioned the few. I do not have many doctoral students. I did not have a doctoral degree myself, and not particularly mathematically inclined, although I started from that end. I started as a very mathematical person, and now having broadened into the field of engineering, I'm not as much interested in that any more.

Swent: You mentioned that you were department chair for a number of years. How did you feel about that job?

Lin: Quite interesting for me. I get along with people.

Swent: That's more administrative.

Lin: More administrative. I think I told you this story: one day the department was in some kind of turmoil, a big internal fight. One professor, Professor Raphael, came into my office and told my secretary, "Doesn't that bother Professor Lin?" She essentially said, "Well, nothing bothers Professor Lin." So I seem to have this temper, I don't get bothered by people arguing. If someone would argue with me and criticize me, I'm happy, because it's good. I can see the other point of view. So I don't have much trouble; I understand people quite well.

Swent: That was a rotating chairmanship, so you--

Lin: Yes, I was there six years or something.

Swent: What about the Academic Senate? Did you work with them at all?

Lin: I had one experience, I think I told you. I think during the day of the Free Speech Movement in Berkeley, lots of student problems, and I was asked by the chancellor to head a commission on educational development, campuswide. So I accepted that commission; they had six of our professor members appointed, I being the chairman. So I said we should add one student member to that commission to see the students' point of view. At that time, this was revolutionary, and the professors didn't like it.

I asked the chancellor to call a faculty meeting, so I did have a meeting. I presented the case why we do want a student member. I said, "I believe the reason you don't want a student member is because perhaps his ideas are so different from ours. But what does that matter? We've got six members on the board, and one student sitting here giving different opinions. If his opinion is good, we'll use it. If it's not good, we certainly will not use it. So there's some fear among ourselves. There's nothing to fear but fear itself."

That really brought down the house. Passed. Brought down the house. So they added one student member.

Now, students are members on the Board of Regents, I think.

Swent: Yes.

Lin: But at that time, 1960, free speech time, professors [growling], students--how could they sit together with us? Those were the old days. But things change.

Swent: Who was the student, do you remember?

Lin: No, I can't remember. I didn't appoint a student; we wanted a student to be appointed by the student body.

Swent: And how did it work out?

Lin: I think it worked out quite well, but more and more are coming this way. We found out we need student members.

Swent: Do you recall that the student made any contribution to your commission?

Lin: Not in detail. I'm sure they did. But it's really the fear, you see? We're afraid.

Swent: People don't like new ideas.

Lin: You're right. And I like these new ideas often. This one is interesting [refers to 8/19 paper]. My conclusion was, see, because they do things wrong often, the Chinese. The engineers not always did good engineering. Some very poor engineering. But no one wants to criticize the other, because if one gets some ideas wrong, and he criticizes him, then he comes back next time and criticizes him. So they approve everything; bureaucrats protect one another. This time, I came out and said that the one design was entirely wrong.

Do you know, across the Yangtze River, they are proposing a bridge which I think was a wrong concept. They admitted it will cost American dollars eighty million more than my proposal, besides making the bridge unsafe and bad-looking, but they still do it, because the designer of the bridge has certain relations with the politicians above. No one dared criticize that, so I brought that matter up. See what will happen.

Swent: Maybe it's just as well you aren't going to be there.

Lin: That's right. [laughs] It should be very political. I say this here, because the premier himself was backing me up, so I dare say it. But even the premier has no direct command over the province.

Swent: So you are speaking out against this Yangtze bridge?

Lin: [growls] Against it. So we'll see what happens. I don't care, you see.

Swent: Yes, it doesn't matter to you.

Lin: Doesn't matter to me. But it's difficult for them. So very poor design. And they want to spend $80 million U.S. to create a name for the designer, because it will be the longest bridge suspension bridge in China.

Swent: How do you feel about the Yangtze River dam?

Lin: The dam, I think, was a good idea. But whether or not we could have done better by using a series of smaller dams, I don't know. But at that time, people were taken by this big idea. The Chinese like that. It's a complicated problem, like us building our Hoover Dam. The project has its strengths and shortcomings, so I don't know.

Swent: I've heard people who were concerned about whether their concrete work is good enough to do that.

Lin: I think there should be no engineering problem.

Swent: You think so? I hope you're right.

Lin: Yes, the Chinese, they can take all that. And the dam is massive enough. Even some fault in the concrete is not going to make it fail. It's like the Hoover Dam. Yes.

Swent: I hope you're right.

Lin: There are other problems. They move about one or two million people. But if they move it according to their plans, that's fine. The money goes down to move these people, say, they required a billion dollars; this guy takes some, that guy takes some, down to the people, maybe only 20 percent left. I don't know how much of that will happen, but it's possible. But China, they make all kinds of mistakes and practice a lot of corruption.

Swent: Well, everybody does.

Lin: Everybody does, yes. Now, we in the U.S. have our dams already built, so we can't complain about it any more.

Swent: That's right. I think perhaps that's a good place to stop; we want to talk in more depth about your company.

Lin: Yes. Next time we'll talk about the company.

Swent: And then we'll begin some of the specific bridges.

Lin: Yes. Next time talk about the company.

INTERVIEW WITH MARGARET LIN

VI MARGARET LIN'S STORY

[Interview 5: August 18, 1999] ##

"Even in China, I Didn't Talk Very Much"

Swent: Let's begin at the end instead of the beginning. I asked you about your life as a faculty wife and you said you really didn't take much part--

M. Lin: I didn't do anything. Very little. Because when I came here I couldn't speak very much English. I learned a little from the radio. So I'm very shy. I didn't want to go to all of the functions. Usually, if T.Y. goes somewhere, I can go with him.

Swent: You traveled a lot?

M. Lin: I traveled a lot.

Lin: All the time. I travel a lot and she travels a lot.

Swent: You enjoyed that?

M. Lin: Travel is fine. But too much gathering, too much party, I don't like.

Lin: She's not very social. So shy.

Swent: You said you went a couple of times to the faculty teas, the women's teas.

M. Lin: The first time, the newcomers tea, I went.

Swent: The newcomers tea, where was that held?

Lin: Faculty Club?

M. Lin: I don't remember. I don't remember. Too long ago.

Lin: Women's Faculty Club--

Swent: And you decided that that was enough?

M. Lin: [laughs] Every time the party was over, I was so happy. Because I did some job.

Lin: Now, she talks loud, she is already much more social than before. She talks very low.

M. Lin: Even in China, I didn't talk very much.

Swent: You were shy. Naturally shy. And then of course, it is harder in a foreign country. And you had your children.

M. Lin: Yes.

Swent: To keep you busy.

M. Lin: Yes. [laughs]

Swent: How did you manage the traveling? Did you have someone to help you with the children?

M. Lin: No.

Swent: Who stayed with the children?

M. Lin: Me.

Lin: When you went to travel?

Swent: When you went away?

M. Lin: You mean here? Either we brought them with us, or later, my sister came over here. She helped a lot.

Swent: So when you traveled away with T.Y., she stayed here with the children?

M. Lin: Yes.

Lin: And, later, also her parents were here.

M. Lin: My parents were here.

Swent: Did they live with you?

M. Lin: Yes. With us on Vincente Avenue. About a couple of years. Then my sister bought a house across the street from us, so--my sister is a good cook. I'm not a good cook. I don't like cooking. So, for the breakfast and lunch, I could manage. But dinnertime, I just let them go across the street to my sister. Because my sister is very good cook. Yes.

Swent: Did she have children?

M. Lin: One. One daughter.

Lin: Her husband was in the Air Force in China.

M. Lin: Accident. Killed.

Lin: Killed.

Swent: So she was alone. A widow then?

M. Lin: Yes.

Swent: So she did the cooking for--just for the children, or did you and T.Y. go across the street for dinner too?

M. Lin: Not often, no.

Swent: But the children did?

M. Lin: Not the children. Just my parents.

Swent: You said you lived on Vincente; where is that?

Lin: Here. Vincente Avenue near Thousand Oaks and Solano streets.

Swent: So you had a big enough house for your family.

M. Lin: We bought a house, after Verna was born.

Swent: You had almost the traditional Chinese extended family then, with the grandparents and the sister, and that was nice. So you didn't need faculty wives for friendship.

Lin: [laughter] Right. She had her sister, and her parents--

M. Lin: But my sister came over, I think, after we been here for eight years. But the first, when I came here, I learned everything here. I didn't know anything about cooking. T.Y. cooked the first meal for us.

Swent: He knew more than you did?

M. Lin: Yes, not very much. [laughs]

Lin: When we arrived in U.S. in 1947, we were housed at Richmond Housing Project. For $35, including everything. So the first time she came, the first meal I prepared for her. I got fried chicken. Several days later, she asked me, "Did you wash the chicken?" [laughter]

Swent: Oh, it must have been awfully hard!

Lin: Yes. It was funny, at the Richmond apartment, upstairs we lived. But then when she was coming, I was cooking, preparing. One of the little girl, maybe six, seven years old, went upstairs and into my room, saw me cooking, and she said, "Are you a mommy?" [laughter] That's funny.

Swent: How did you come here? By airplane?

M. Lin: By boat. I came by *General Gordon* in 1947, from Shanghai.

Swent: I can imagine how nervous you were, with two little ones.

M. Lin: No, just one, just Paul.

Life in Shanghai in the 1940s

Swent: In '47, in Shanghai, what was the situation like there then?

M. Lin: '47, that's after the war--

Swent: After World War II, but before the Communist revolution.

Lin: But before the Communist took over.

Swent: What was it like?

M. Lin: Not good. [laughs]

Swent: In what way?

M. Lin: Just after the war. That time I stayed with my brother there. Where were my parents?

Lin: In Fujian. Her parents escaped from the Japanese during the Japanese occupation of Shanghai, so they escaped to Fujian, the province where they were born.

Swent: From where? From Nanjing to Fujian?

Lin: First from Nanjing to Shanghai, then Shanghai to Fujian.

Swent: You said they escaped. What does that mean? How did they do that?

M. Lin: What do you mean?

Swent: I mean, how did they actually travel...by foot or by train?

M. Lin: By boat, to Fujian.

Swent: Did they have to cover their faces or hide?

M. Lin: In a way, yes. Now I went to Shanghai in 1942, because I was pregnant--

Swent: You had been in Chengdu?

M. Lin: That was later, not before--

Lin: We were married in 1941 in Kunming. After that she went back to--

M. Lin: --to Shanghai.

Swent: And how did you travel to Shanghai at that time?

M. Lin: That time, from Kunming, I flew to Chongqing. And from Chongqing to Hong Kong. Then, I took the last boat from Macau to Shanghai.

Swent: Did you know it was the last boat at that time?

M. Lin: I didn't know. Because I was pregnant, nobody told me anything.

Lin: It's December 12th, 1942. [1941]

M. Lin: I left Macau on December 5th. Arrived to Shanghai December 12th.

Lin: December 7th, was Pearl Harbor.

M. Lin: Pearl Harbor, I was on the sea.

Swent: Seven days from Macau to Shanghai? That's a long time!

M. Lin: That's a freighter!

Swent: When did you first hear of Pearl Harbor, or the bombing of Pearl Harbor?

M. Lin: I heard the people on the boat talk about it. They try not to tell me because I was pregnant. And I was so quiet. I didn't talk at all to people.

Swent: You were alone?

M. Lin: Alone. Yes. My brother tried to introduce me to somebody on the boat.

Lin: Her brother was in Hong Kong.

M. Lin: In Hong Kong. His friend just tried to look after me. But I didn't know him very well, so I seldom talked.

Swent: How many brothers do you have?

M. Lin: I have three brothers, and two sisters. All together six. The brother introduced one friend from Hong Kong.

Swent: I see. And you didn't know him very well. How did you go from Hong Kong to Macau?

M. Lin: Ferry boat I think.

Swent: The Japanese on December 7th also bombed Hong Kong, didn't they? Or Macau?

Lin: No, they occupied it. Did not bomb it. They occupied it.

Swent: Occupied. Without bombing, okay. Because at the same time, they went to Hong Kong and Singapore, didn't they?

Lin: Yes, they occupied Singapore also.

Swent: So you left Macau, and didn't realize of course--

M. Lin: No, I didn't know. I knew it was war time. Before the war, we stayed in Nanjing, then in '37 we left Nanjing to Shanghai where were foreign concessions. So we stayed in Shanghai for a couple of years.

Lin: Then the so-called "Rape of Nanjing" took place.

Swent: But you had already left Nanjing then? Fortunately.

Lin: Yes. Fortunately.

M. Lin: I think at that time you were already in Chongqing.

Lin: Yes.

Swent: And you were not yet married.

M. Lin: No.

Swent: So you went to Shanghai then, in December of '41.

Lin: Yes, back to Shanghai in '41.

Swent: To stay with your mother--

M. Lin: My parents and one sister. Not Yvonne this sister in Kunming; the other one who was older than I. Because she was always in bad health, so she didn't go with me to Kunming, she just stayed in Shanghai.

Swent: What sort of house did you have in Shanghai?

M. Lin: Like an apartment. [Ching Ahn Bieh Su--referring to the name of the location where these apartments were located] An apartment house.

Swent: Upstairs?

Lin: One, two flights.

M. Lin: Downstairs for living room, and up, maybe two bedrooms.

Lin: Typical Shanghai apartment, not bad. In the concessions. Not bad. But, you know.

Swent: And there was food? Was there enough food or was it hard to get food?

M. Lin: I remember, because, when I was pregnant, I loved to eat. I ate a lot. But could not get everything for meal supply. One would need tickets to buy flour and rice. Very bad time there.

Lin: Control.

M. Lin: I remember the rice I cooked with all this dirty stuff. My father always said, "How can you eat that?" Usually after lunch, my father always took a nap. After his nap, I was still downstairs, in the kitchen, trying to cook something for myself. My father says, "How come you can eat that much! Good appetite."

Swent: You were very hungry. But the rice wasn't clean?

M. Lin: No, the food was bad.

Swent: You ate it anyway.

M. Lin: I ate it anyway.

Swent: Could you get vegetables?

M. Lin: Yes.

Lin: Shanghai was not so bad, you know. The country was worse.

M. Lin: That time, when Japanese sometimes dropped bombs there, so our light went out, always very dim, very dark.

Swent: How were you communicating with T.Y. at that time? Could you send letters?

M. Lin: I think so.

Lin: With letters.

M. Lin: Then, he wrote me a map about how could we go back to the inland. I went back from Shanghai to Chongqing, then go to Lanchow. He wrote me where to go. I was so scared. Because the Japanese always tried to come to the place. Sometimes, they tried to search. So, I was very nervous. But my mother was always very brave. My father's very timid like me. [laughs] I was like my father, not like my mother. My mother was very brave. She did not care, "Here," she say, "don't be afraid! Give it to me! I keep it for you."

So, usually when, in the evening, middle of night, I heard the sound of shoes, like a whole group of army walking through the street. I got so nervous, I just lay down on the bed, and cover my head. So my mother said, "Where do I put this? Where do I put this?" I wanted to hide this map and everything. My mother, "Give it to me." Anything I was afraid of, my mother took care of it. So, finally, when I woke up, I sweat a lot, but it's gone. Usually once in a while, the Japanese came over.

Lin: Search your house.

M. Lin: Search. Search the whole building.

Paul Lin Born in Shanghai, 1942

Swent: This is after Paul was born? When he was a baby?

M. Lin: Yes. Just born, because beginning of '42 I think.

Lin: Then she went inland later '42.

Swent: We will talk about that in just a minute. Paul was born. Was he born in a hospital?

M. Lin: Yes. Very good hospital.

Lin: That's one reason why she went to Shanghai.

M. Lin: Yes.

Swent: Which hospital was it? What was the name of it?

M. Lin: Dr. Wong Yee Hwei.

Lin: Dr. Wong Yee Hwei. Dr. Wong. Don't know the name of the hospital. The doctor was very good.

M. Lin: His wife is Caucasian. I don't know which country from.

Swent: So you had good medical care. Was it a difficult birth?

M. Lin: I had a little surgery.

Swent: Did you?

M. Lin: Yes. Because I eat too much. [laughter] Usually the doctor always said, "Don't eat too much, it is difficult to give birth." But I didn't know. I just keep on eating and eating. [laughter] I think that's because of the pregnancy.

Swent: Was Paul a big baby?

M. Lin: Seven-and-a-half pounds.

Swent: Oh, he was big.

M. Lin: But I was big. They thought could be twins, looking at the size of me. That's also true when Verna was born, here. I still ate a lot because every time I'm pregnant, as soon as I get pregnant, I felt so dirty in the mouth so I had to spit all the time. Otherwise I had to eat all the time. If I didn't eat I had to spit. I couldn't swallow. I didn't want to swallow. So, but when I had Verna, the same trouble. So in one month, I gained seven pounds. Doctor Wong said, "What did you eat?" I said, "I have to eat something." Then when having Verna I went to check with the doctor--

Lin: Kaiser Hospital.

M. Lin: Kaiser. Doctor said, "What is it in your mouth?"

I said, "Some plum or something." I said, "Yes, I have something."

They said, "Don't eat that thing. You gained too much. Too much weight." So, the second month I tried not to eat too much. I still gained four pounds. Then the third time I went, he said, "Here, take the list, on diet. If you are hungry get a stick of celery, or a carrot. If you have salad, no salad dressing. If you have your meal, half a sandwich. So I was always hungry! But I ate little all the way. Finally, I gained fifteen pounds all together. But it's always the first couple months I already got that much. [laughs] So my friends said, "Well, don't listen to the doctor. Because, see, when you have the baby, probably too tiny." But Verna, I think, weighed seven pounds and twelve ounces. Big one. And I was big.

Swent: So when Paul was born your mother was there and your sister, but not your husband--

M. Lin: Yes, they took care of me. But when Verna was born, there was no help, except the Kaiser people. [laughs]

Swent: No, you were here, all alone. So let's go back to when Paul was born; you had to have a Cesarean?

Lin: Surgery?

M. Lin: Yes.

Lin: Yes.

Swent: That must have been awfully difficult. Took you a long time to get over it?

M. Lin: I think, in China, you can stay in the hospital for seven days. Now after that, when I came back home, in Chinese custom, you're supposed to be in bed about one month. [laughter] So after that month I couldn't even stand up because [I was always on my back]...too weak.

Swent: Did they have a red egg party?

M. Lin: Yes--

Swent: After one month? Did your family do that?

M. Lin: Yes.

Swent: All the traditions--

M. Lin: Traditions. Always gives you something nourishing. [laughs]

Swent: Pig's feet? Right?

M. Lin: [laughter] Pig's feet. You know about this!

Swent: Well, a little bit. It's good for you, I think.

M. Lin: In Kunming, I think I was always a big eater. Now my sister lives on Vincente Avenue, in the house we used to live. We two together, always eat a lot. And, we weigh almost the same. One hundred twenty pounds, in Kunnming.

Lin: How much are you now?

M. Lin: Now 104. When I came over here in '47, I weigh 103. But now, I didn't gain too much weight. But I cannot wear all the older dresses.

Lin: When she was at college, she weighed 120 pounds.

Swent: Oh, you were bigger then!

M. Lin: Yeah. Just that time, I think. Just that period of time.

Lin: When I came to this country I weighed only 108. Skinny.

Swent: How much do you weigh now?

Lin: 125.

Swent: Not very much, you're both very thin. So Paul was a healthy baby?

M. Lin: Yes. Because I did everything on schedule. So, I nursed Paul. So, I had a rule. I nursed him one side, five minutes, then turn to the other side, five minutes, that's it. I don't know if he's okay or not. [laughs] That's my rule. Oh, and when I escaped from Shanghai to Chongqing, because it took fifty-three days on the way, we had all kinds of trouble. I didn't want him to make any noise, so any time he made noise, I nursed him.

Lin: [laughter] She went through the Japanese front lines.

Swent: Now, let's talk about that. How did you plan to do that? You were in Shanghai, you had had the baby, you had a Cesarean section? They cut you open?

Lin: Just a little one.

M. Lin: Just a little bit. [probably an epesiotomy]

Swent: So you were in the hospital for a week and recovering for a month? Lots of attention from your mother.

M. Lin: [laughter] Yes.

Swent: Were they thrilled because it was a boy baby?

M. Lin: They loved it. They called little 'Xiao Yen'--

Lin: Little T.Y. My son look just like me.

Swent: Was this the first grandchild for your parents?

Lin: Yes. For my parents.

M. Lin: For your parents.

Lin: Her brothers had some children. This is the first one for my parents.

Swent: Your parents were still in Nanjing?

M. Lin: No, I think they moved too.

Lin: To Shanghai first.

M. Lin: They probably left to [Bei Pei]--

Lin: To Chongqing, then Bei Pei. My parents were in Chongqing when the war started--

M. Lin: They already left.

Lin: I was in Chongqing. A few days before the war started, I got a telegraph from my parents, "We are moving to Chongqing!" The entire Chiang Kai-shek government was moving from Nanjing to Chongqing and there they stayed during the war.

Going From Shanghai Through the Japanese Lines to Chongqing

Swent: So then you wanted to go back and be with your husband?

M. Lin: Yes. I wanted to go back. And besides that, we had to leave, because my parents did not want to stay in Shanghai. You know, they had trouble there, because the Japanese always tried to make trouble with them. So, if we didn't leave Shanghai, my parents couldn't leave. So finally, the other sister, my elder sister Kay, went with me to inland.

Swent: And she was the one who was not well?

M. Lin: Yes. But after that, she became healthy. [laughter]

Swent: Toughened her up--

M. Lin: Usually, we go out, if there was a little drizzle, when she came back, she got cold. She couldn't help it. But after those fifty-three days of tough travel, because I couldn't do too much on the trip. I could only take care of myself. She tried to take care of other things, to help me a little. I had to take care of Paul all the time. I had to nurse him, put the diaper, et cetera.

Swent: Did you have diapers?

M. Lin: No. [laughs]

Lin: What do you use for diaper?

M. Lin: I use the sheets. The sheets, torn off. Probably you know something, too. Tear off the sheets. I have about eleven pieces of this thing. You have to use that--

Swent: And you have to try to wash them every day?

Lin: Yes.

M. Lin: So when I was traveling there, some places very little hut, with mud-made k'ang, heated with like fire below burning horse doo under it, to warm the bed--you probably know that--

Swent: Yes, like a k'ang.

Lin: K'ang!

M. Lin: Yes, it's k'ang. Yes! Usually I went to this little hut there. Because we had to stay overnight there. So I took out all the diapers and wash them, and I just had Paul on my back. [She stands up to demonstrate drying the diapers in the smoke.] I tied it over here, because I couldn't get anybody to help me. So I have these eleven piece of diapers, I closed my eyes, trying to dry these, because you know, the smoke bothered my eyes. Every day, when we walked, every day, we stopped on one place, and then did the same thing. And then the next and then next.

Lin: Along the Yangtze.

Swent: Was there enough water?

M. Lin: [laughter] We got water.

Lin: It came from the river! It's not drinkable.

Swent: Dirty water. Everything dirty.

M. Lin: But, I think, I could stand that. [laughs] After all these things, you got used to this!

Fifty-Three Days by Ship, Boat, Horseback, and Sedan Chair

Swent: It's surprising what you can do, isn't it? So you started out from Shanghai, by what? On a train?

Lin: Boat.

M. Lin: First, the first nine days were good, from Shanghai to Hankow, took regular ship.

Swent: A Chinese ship?

M. Lin: Yes, it's a big one.

Swent: And you paid for your passage just like--

M. Lin: Yes.

Swent: And the Japanese didn't give you any trouble?

M. Lin: This part, okay.

Lin: Shanghai to Hankow is okay.

M. Lin: But after that, we had to take junk, little boat with a little cover there. That's the place I washed my diapers. The diapers were all white. I didn't want to show there. I didn't want the Japanese to see it. So I washed always inside. We always hided.

Swent: Hiding--now from Hankow, you took the junk up the river then?

M. Lin: Yes. That took many, many days. I don't know how many it was. But every evening, you docked on someplace, maybe ten days. Because everyday, you can only sail a litle bit. Very slow.

Swent: And this was--you paid somebody? They ran the boat.

M. Lin: Yes.

Lin: They went as a group, about ten people.

M. Lin: First, they had ten people, but different boats. It's not in one boat. We only, my sister, myself, and my sister-in-law, my brother's wife, with her little daughter, a little older than Paul. Paul little more than six months, and another cousin. Five of us in one of the junk. But on the way, we met some people. We met some men. They had a group. So we have a few boats together, but separately, one by one.

Lin: Joined together as a group.

M. Lin: Joined together as a group.

Swent: Did you have to have documents of some sort?

M. Lin: No.

Lin: [after some deliberation] Oh yes, within China. But to pass the Japanese front lines they didn't require it. But they examine you. Tell the story of the Japanese soldier--

M. Lin: From Shanghai until I got to Chongqing, they search our luggage about forty some times on the way. But the Japanese, if they search you, we learned that they like cigarettes. So all the people learned, and bought some cigarettes, put it in the suitcase. If they opened it, just gave it to them. So at one place, Japanese saw [my] Ren Ming Tsen--Republic People's Certificate.

Lin: Certificate--

M. Lin: Yes--had a picture. And one of the Japanese said, "Can I have the picture?" I said, "Sure."

Lin: A picture, a pretty picture.

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Swent: It was just a young soldier. He wanted the picture of the pretty girl.

Lin: Yes. [laughter]

M. Lin: I wasn't pretty at all. I went because, like you said, you cannot look very clean, very neat. So I have those big clothes. The one, when I had Paul, before Paul was born.

Lin: Big clothing.

M. Lin: Whole, big thing. Looked fat.

Swent: Maternity outfit?

Lin: Maternity, yes, right.

M. Lin: Yes.

Swent: What did you wear? Pants?

M. Lin: No. Just thick cotton dress.

Lin: Cotton.

M. Lin: Cotton. Keeping warm. But that's wintertime. So--

Lin: In the other room, the Japanese soldiers or the Chinese--

M. Lin: Both.

Swent: The Chinese were the Chiang Kai-shek people?

Lin: Yes.

M. Lin: Yes.

Swent: You didn't get to the Communist section?

Lin: No.

M. Lin: No.

Swent: So you went up from Hankow, my geography isn't very good--

Lin: To Ichang I think--

M. Lin: From Hankow. Then all through Hubei.

Lin: Up Yangtze River.

Swent: And was there enough food?

M. Lin: No. [laughs] Morning, before we start, always they had rice. They have this, 'pao tsai'--

Lin: Preserved vegetables--

M. Lin: Coolie always ate that.

Swent: Sort of pickled cabbage kind of thing--

Lin: Yes. Pickled. No meat, and so every morning I got three bowls of rice [laughs], I had three bowls of rice and the pickled thing.

Swent: And you were nursing Paul, so you needed---

M. Lin: Yes, I was nursing Paul, and usually, I bought a little bit of cookies with sesame, so I tied it on my wrist. Whenever Paul cried, I took some and gave it to him to keep him quiet. But because of my nursing Paul, so on the way, the boat, the boat owner?

Lin: Yes.

Swent: The boatman I guess you can say--

M. Lin: The boatman, you cannot say owner. He's very good. He tried to take care of me. He bought some pork, and cooked the pork with soup for me to drink. So, I can have better nourishing for Paul. Because of this, we lost track of the other boats. So we are left behind. So, we stay one day more, behind them, in the evening. Because winter time, the skies became dark very early, so we couldn't follow them. So we stayed one more night there. Then all these people, about three of these, with Chinese little cap and a knot on top, "You want some safety? [laughter] You want to take care of you?" We paid. We paid them to keep us safe.

Lin: The Chinese bandits--

M. Lin: In the no-man's land, us Chinese call them San Bu Gwan.

Lin: On the borderline, nobody took care of you. Chinese or Japanese. But money helped.

Swent: These were borders between states or provinces?

Lin: No. Just in the occupied Chinese land.

M. Lin: Any place they can check you.

Lin: It's not a formal gate or anything. The area was controlled by both.

Swent: By both. They are both checking.

Lin: Yes. Then you took a horse ride?

M. Lin: Yes. We had horseback riding, for a few days. And sedan chair riding for a few days. And then, changed our boat three times. First, we just five of us. And then some soldiers wanted us to take them with us. We just couldn't refuse. We had to take them. And then, when that time we didn't sit anywhere, we sat like sardines. One this way, one that way, and all packed.

Swent: And at night the boat stopped?

M. Lin: At night the boat stopped--

Swent: And you just slept like that?

M. Lin: Yes.

Swent: What did you do for toilet?

M. Lin: [laughter] Toilet, usually got a corner. If you couldn't get one, it's okay. Otherwise, under the boat, just got a corner. Finally, we had, for one part of the time, we had a big boat, which was the freighter. My sister-in-law, she could deal with people, always talked them into something. So finally, we got a big boat, the freighter, it went the same way as we did. So, we wanted to get onto that boat. They refuse, they said, "No ladies! Only for men, and only freight!" Some coal. The whole boat full of coal. So my sister-in-law said, "Well, we try to help you." So they get some soldiers sit with us. "But now, you have to help me. Help both of us." Because my sister-in-law said her husband was working for the government. "My husband is working for the government. You should help us."

So finally talked them into it. And they say, "All right, on one condition. You can come to the boat during the midnight.

You can't be here until we loaded everything, put everything in there; then you can sneak in." So finally, winter evening, I sat on shore, sit on that, where you anchor the boat, what you call that?

Swent: A bollard?

M. Lin: Bollard, yes. I just held Paul and sat there until midnight. After everything was loaded on, they went in. In the very lower deck, we took a place, only about that little bit--

Swent: About six feet--

M. Lin: We put a piece of sheets there. When you want to get to toilet, you put something there and we had one friend in front [laughs] stand in front--

Lin: To cover it--

M. Lin: Yes, so we did that all the way.

Swent: Oh, it must have been just terrible! Fifty-three days!

M. Lin: Yes, fifty-three days, different locations.

Swent: So was this freighter the final stage? Was that it?

M. Lin: No. No, we were still in the first part of this. After that, we'd take horseback riding. I never had this before and never knew how to ride the horse.

Swent: Frightening.

Lin: Horseback. With the trail.

M. Lin: With the trail. Whenever I go that way, and only one way to go. So--

Swent: Was this still along the river?

M. Lin: Yes. Yes.

Swent: Are the trails high? Up above the river?

M. Lin: Yes. Yes. On side. So we have this--all the men, maybe they had the horseback riding before. They took the horse. The first day, I didn't take the horse because I didn't know how to ride on a horse. So my sister-in-law, and my sister, and me, we three didn't ride on a horse.

Swent: What did you do?

M. Lin: Follow the horse. [laughs]

Lin: Walk.

Swent: Walk? With Paul on your back?

M. Lin: Yes. And I bought a pair of shoes from Baja. You know, these were very good shoes, with a little heel there.

Lin: Baja. High heel shoes.

M. Lin: I didn't know I had to walk! So I just wore this pair of shoes. That day just happened it was raining. So I had Paul on my back, and I had these shoes. I walked and I stuck in the mud. And I pulled it out and walk, and walk, walk. It's not too far away, but every day I walked, it took a long time.

Swent: And you had luggage too?

M. Lin: Luggage on the horse. Luggage. That's why my sister say, "You have to walk faster! Because they won't wait for you." On that day, I said, "You take Paul. Take Paul to T.Y. I'm not going. I'll die here. I couldn't--I just suffered too much. I just give up hope. I couldn't take it. But that's the first day. The second day, my sister-in-law was very good. She walked, but her daughter--somebody took care of her, on the horse with some men.

Lin: She could talk and talk to people.

M. Lin: Because she could talk people to do things. I couldn't. I decided that I won't want to ask people do things for me. If they do things for me, I appreciate it very much, but I didn't ask, "Can you take Paul?" I could not do that. So the first day, they all got there, only my sister-in-law, and myself, and Paul on my back, we three got lost. We try to get there, but too far away. Couldn't catch up. We didn't know where. Always on the way we ask people, once in a while, I said, "How long when we get there?" They said, "About two lis." After a while, "Four lis." How long! We got so frustrated. Didn't know what to do! So finally, one of the men with us together came back after they got there; they couldn't see us, already dark. He walked back here and saw us. So we went there, safely that day. The second day, because we had, I think about five, six days, to do horseback riding. We could not do that every day, walking. So the second day, I got up, on the horse. I had to put Paul in front of me, to be safe. So I never rode a horse, but they said, "You have to take a stick or something, if you want the horse go faster." So I took one like this. Our luggage on one of the horse, in front, we just tried to follow. It's quite a few horses there, some with people, some with luggage. So, I'm in the back. Anytime I see it's too far away, I just whip it. Whip it, you have to get your legs to try to squeeze. That day, when we got there, when I came down, I really just lie flat.

Swent: Your legs were just--

M. Lin: Very paralyzed because too tight there. That was the second day. Later it's a little better.

Swent: You got used to it.

M. Lin: Yes, but Paul and I fell off from the horse. Because, once on the way, the horse wanted to eat the grass. He bent down, so Paul and I just slipped and fall ahead. But didn't get hurt. [laughs] And my sister-in-law's horse went to some little hut, inside of somewhere. [laughs] Because it didn't know what to do! All kinds of crazy things happened.

Swent: How did you carry money with you?

M. Lin: Carry? We just hid here and there.

Swent: Inside your clothes?

M. Lin: Yes. I think my sister-in-law do something, put them in, you know, the sole--

Swent: --of the shoes?

M. Lin: --in between that thing.

Lin: After the horse ride, do you have sedan chairs?

M. Lin: Sedan chairs.

Lin: Place get narrower and narrower.

M. Lin: Sedan chair, two men, one up and one in the back. They always argue with me because I'm too big. And, besides, now that I had Paul. My sister, very thin, very light. I can see her sedan chair just fly. Very light. But me in the back! So heavy! And these two men fought all the time! They said, "Too heavy. You're too heavy and your baby is heavy too." Argue all the way. I said, "All right!" I couldn't stand it. I say, "Okay. When the baby take a nap, sleep, I came down walk with you." But I did that quite a few days. When Paul was asleep, they say, "Now you come down." [laughs] So I walked with them.

Swent: And left Paul in the sedan chair?

M. Lin: Maybe that because even now I'm very healthy. [laughs] Had training.

Swent: Well, if you could survive that--

Lin: Yes! Yes! And I, by nature, I just always feel peaceful. I was waiting in Lanchow in inland China, and at first you become safe in there while she suffering all this.

Swent: You had no idea that it could be so bad?

Lin: I had no idea. No idea. I knew it's bad. I knew this area.

M. Lin: And beside, I was very scared. In the evening, sometimes, always in the evening, in the little hut. So we have the four of us, and then another ten men. We all sleep on the k'ang. They had a little candle there. I always worried the candle, then later maybe got fire. I always said, "Put out the candle!"

I always worried. And we didn't know, I did't know whether the luggage was here or not. Nobody knew. But you know, fifty-three days, it's pretty good. We didn't lose any luggage. We couldn't see our luggage during the daytime because it's all up to them.

Swent: But they didn't steal it?

Lin: No, no. They have a way of managing it, we just paid money.

M. Lin: Like the horse, every morning we saw the horse, the whole group of men riding the horse. I will have some men lead the horse. I want to try to see. I don't want to lost the men try to lead the horse. Always, every day, all of a sudden, the men disappeared. I never can figure out, even now, I couldn't figure out when they disappeared?

Lin: You know what I think? They disappeared to take opium. All these coolies in the area. They all took opium.

M. Lin: The opium, but I didn't know. But maybe all the horses knew where to go. Because nobody to take care of it, but our luggage still got there.

Lin: That's really something, you know? Like when I worked on the Chinese railroad I had coolies, a few hundred of them, they work very hard. At night time, they either went to opium or something. And they organize themselves, they just took care of the foreman, who automatically took care of the coolies. Same thing here, I think. Tell about the story of the falling house.

M. Lin: Oh, another thing, when we were enroute, because the whole group know I couldn't do very much. In the morning, I always put the diaper on, the first, the first thing, put diaper on. And the luggage, usually my sister try to take care of it. I couldn't do too many things. So one day, in the evening, we have to take a place to rest, to the spend the night, so the group all said, "You cannot do anything standing here with us." Because I cannot take care of the luggage. I cannot watch the luggage.

Lin: You take care of Paul.

M. Lin: "Okay, you have Paul. You just take Paul to go to the place. You stay there, wait for us." So we went there, waiting for them. So to the people in the hut, I said, "Can you give me some hot water?" Because on the way, you cannot take a bath or anything. Now, as long as we got here, I want some water, since I have to wait for them, I have time. So please get some hot water so I can clean up. So when they got the water here, I just tried to put Paul on the k'ang, and with other bedding to wrap on the side. Because he still cannot sit straight. See. So now I said, I have a little time. I saw the hot water. I was so glad that I could try to clean up. All of a sudden, "klaaaang", like bomb.

Lin: The whole house fell--

M. Lin: The whole, whole building, because everybody tried to pass this way, so they tried to build some extra room. I think they didn't do a very good job. Just [makes clucking noise] the whole thing fell in front of us. We're in the back, the old part. The front all collapsed.

Lin: All collapsed!

Swent: All collapsed!

M. Lin: So when they heard about this, they come over, and said probably I will be gone. Because they didn't know. They put me in this place to wait for them.

Lin: The front fell while she was in the back. [laughter]

M. Lin: Yes. I was in the back. Yes.

Swent: The front fell but you were in the back, so you were okay?

M. Lin: I was okay. But after that the noise, I went there, grab Paul! [laughs] I wanted to leave. I just went out and said, "I'm not going to stay here." So when they came they saw I'm still there. They said, "No, you don't want to stay here; then we try somewhere else." So we went out, try somewhere, couldn't find anyplace. So we still went back to the old one, still go to same place. So that evening, I couldn't sleep, I just watch, watch the ceiling. So scared. You know that's one of these places. Another place caught fire in front of us.

Swent: The house burned?

M. Lin: House burned.

Swent: What were these huts made of? Were they made of sticks?

M. Lin: Yes. Yes. Just very unstable things--

Swent: With mud?

M. Lin: Just for--mud, yes. Just for--

Swent: Sticks and mud. I guess what we call 'wattle' and 'daub'.

M. Lin: It's those straw huts.

Lin: Straw and everything.

Swent: And then the roof was--

M. Lin: Just very, very--thin.

Swent: Oh my!

Lin: Oh my! is right.

M. Lin: The last part is not bad. The last part--

Lin: Was Wan Hsien.

M. Lin: Wan Hsien, not far from Chongqing, I think. That's the last stop, from Wan Hsien to Chongqing. We took a boat, I bought a ticket. Really, on the way, I don't know how much money I spend. I don't know.

Swent: Well, you had to spend whatever you had to.

Lin: Yes.

Swent: I'm surprised that you weren't robbed.

Lin: That's right. Apparently someone organized it. All these bandits you call them. They were somewhat organized. Just get money. Very tough. The people here don't know, but the Chinese--

Swent: No, although I think things were about the same here a hundred years ago.

Lin: Yes. True. True.

Swent: Traveling. I have heard stories of people being held up; you know, they would take a boat, and then the boatman would stop part way and say, "Pay me some more money--" [laughter]

Lin: Yes. That's right!

Swent: --"or I won't take you the rest of the way." Yes, it happens everywhere. But the last part wasn't so bad then?

M. Lin: The last part, at least we had the regular boat. Not just--

Lin: I was in Lanchow when you arrived in Chongqing, but my parents were there too. So she stay near Chongqing with my parents for a few months.

M. Lin: Then we went to Lanchow to meet T.Y.

Swent: Flew?

M. Lin: Yes. Flew over.

Lin: Although the airplane was very difficult to buy a ticket.

M. Lin: But usually in China, I always vomit in the airplane.

Swent: You got airsick.

M. Lin: Yes. Because the airplane was so small. It's terrible!

Swent: But Paul was healthy through all of this?

M. Lin: He was all right, until we went there. He got malaria when we got there.

Lin: In Chongqing, Paul got malaria.

Swent: Just a baby.

Lin: Yes, just a baby.

Swent: Where did you stay in Chongqing?

M. Lin: Chongqing, with my uncle.

Lin: Yes. Seventeenth uncle, eh?

M. Lin: Seventeenth uncle.

Swent: Seventeenth uncle! [chuckles]

M. Lin: When I got to Chongqing, after fifty-three days, my clothes all got lice.

Swent: Oh, sure!

M. Lin: [laughs] You're not surprised!

Swent: Of course! Bed bugs and everything else, probably. Oh! How awful!

Lin: This is quite a wife I have, eh?

M. Lin: And because my shoes, I walk about a few days in those loose shoes, my toenails--

Lin: --fell off--

M. Lin: --then become black, finally fell off. I bought the shoes on the way, in the country side, big ones for men. Nobody can come near me. I said, "Stay away!" I was afraid if anyone touched my foot.

Swent: Because it hurt so bad--

M. Lin: Because it hurt. I said, "Don't come near me!" Finally, toenail came off.

Lin: Survive, eh? Usually, surprise about people!

M. Lin: I got it back. It's okay. I thought I just lost--

Swent: You're still dancing, so your feet must have recovered.

M. Lin: Yes.

Swent: But how awfully hard; you must have had blisters and everything else.

M. Lin: Yes. Everything. But I was the only one who gained weight. [laughs]

Lin: Is something wrong with you!

M. Lin: There's so many people. Everybody, only me I gain weight!

Swent: Eating so much rice.

M. Lin: Yes. Three bowl of rice everyday.

Swent: That's just wonderful that you can laugh about it now.

Lin: Right! Yes.

Hollywood Stars and Autographs

Swent: Well, you know, if you could survive that, then you didn't have to be afraid of anything ever again, did you?

M. Lin: [laughs]

Lin: Yes. All of this is sort of compensated, when we came to America. Did you tell the story, we went to Hollywood and saw all the movie stars? We arrived, finally, in 1946.

M. Lin: In 1947.

Lin: In 1946 I arrived U.S.A.; '47 you arrived.

So, okay, '48 we went to Hollywood, and knocked at the doors of all the movie stars. She got all their photographs and several of their autographs.

M. Lin: I was so nervous! I was nervous. Usually I don't do this kind of thing. But I just wanted to see movie stars, so I got heavy heartbeat, but I still went there knocking on the doors--

Lin: --go to see the movie stars.

Swent: Really? Went up to their house?

M. Lin: Yes. Knock on doors. This was okay then. Now, nobody'd open the door for you.

Lin: We had a map show where the houses are.

M. Lin: We bought a pamphlet showing the streets of movie stars' houses in Hollywood.

Swent: It gave their addresses?

M. Lin: Yes. I got the addresses and--

Swent: What movie stars? Do you remember their names?

M. Lin: All the old ones. Fred Astaire. Ginger Rogers. Joan Crawford, et cetera.

Lin: And who's the one that you got out of the car for?

M. Lin: That's Barbara Stanwyck. I saw Barbara Stanwyck playing with a dog on the yard. So we drove there, and Paul sat on the side. So I saw Barbara Stanwyck, and--

Lin: She knew it's Barbara Stanwyck!

M. Lin: I opened the door and walked straight down. Paul said, "Mom, what are you doing!" [laughs]

Lin: She's crazy about movie stars. She said, "Oh! It's Barbara Stanwyck;" just jumped out!

M. Lin: The thing is, I asked for Barbara Stanwyck's autograph. At that time, Barbara Stanwyck is with Robert Taylor. So the maid there ask me, "You want Robert Taylor's picture too?" I said "No." I don't know why! I don't know why I said that. After that I regret it. [laughter]

Lin: She's all for girls only--

Swent: But you got all the big ones.

Lin: Now we couldn't find all these photos. She put it somewhere in this house.

M. Lin: I hid it. Hidden treasure. I couldn't find it. I don't know where I put it.

Swent: Well, they'll turn up some day.

M. Lin: Yes.

Lin: Yes.

M. Lin: I think some day they will turn up.

Ballroom Dancing

Swent: When did you begin dancing?

M. Lin: Begin dancing. That really started in Kunming the first time. I didn't know how to dance. Even in Kunming. Because usually my parents were very much against dancing.

Lin: It's too modern.

M. Lin: Because dancing, man and woman together, touch. They don't like it. So when we went to Kunming, to the university, we had never danced. But one evening, they had a party, a friend, a classmate give a party, with dancing. But I couldn't dance, that's before we married.

Lin: I think just before we're married.

M. Lin: T.Y. said, "You just stand there!" I said, "I don't dance." So the man stand there say, "You shouldn't stand there." And finally, I started to dance.

Lin: Danced all night!

M. Lin: I always step on their feet. So that evening, because celebration for the new year, I think New Year's Eve. So--

Lin: That's in Kunming before we were married.

M. Lin: In Kunming, and so everybody just danced and I don't know what I did. Anyway, just do it. [laughs]

Swent: You danced with T.Y.?

M. Lin: No. He doesn't know how to dance. And I don't know how to dance. But some others in the party did. So then we try to learn some dance from our friend.

Lin: Yes. Lo. Mr. Lo was an old friend who--.

M. Lin: He started dancing from forty I think. From age forty. He tried to dance. You stand straight. What's the posture and everything. He taught us quite a lot.

Lin: Yes! Yes!

Swent: This is in Kunming?

M. Lin: In Kunming.

Lin: Lo's quite a good dancer.

M. Lin: That's the beginning. We really didn't know very much. Just a little bit.

Swent: But you enjoyed it right from the beginning?

Lin: Yes. She liked dancing by nature.

M. Lin: Then when we came here, to U.S.A., we never thought about taking dancing lessons, but one day, we drove around University Avenue or something, maybe near Dwight Way. We saw the sign, 'Teaching Dancing', so we went in.

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M. Lin: Another day, T.Y. was driving to work, and the radio played a tune. "Arthur Murray Studio". Said that if you can name the tune, you get a free lesson. So he tried that. If I were driving the car, I wouldn't do it. I'm timid. So he call back. I don't know which song. He said, "Is that this?" They said, "Yes. You are right."

Lin: Right or wrong, is right! [laughter]

M. Lin: He wanted to go there. So we went to the studio. And they want us to try, to show them how much we know. So I told T.Y., I said, "Don't do this. Don't do that step that the teacher taught."

Lin: He was a very poor teacher.

M. Lin I said, "This no good" because we only paid four dollars for a lesson. When we tried a few steps, they said, "It's fine. It's okay. But you can improve a little bit." So we went to Arthur Murray Studio to take lessons, about every two weeks, we took one lesson. After that, of course we went back and tried more.

Swent: At home?

M. Lin: At home. When we went back. After the lesson, and it still didn't look right. [laughter] He said, "You practiced. But you didn't practice right." See. Finally we had separate lessons. So he took from a lady instructor. I take from a man instructor. That is the way we started. Then we got hooked. [laughs] Now we cannot afford not to take lessons. So kind of want to keep it up.

Lin: Yes, very beautiful!

Swent: Well, then you became--

Lin: Arthur Murray students.

M. Lin: Arthur Murray. Because we heard one of friends said, "If you take dance lessons, that's the only place to go. That's Arthur Murray." That's why we went there.

Swent: Then, you became famous for your dancing--

Lin: Yes, in a way.

M. Lin: The Arthur Murray Studio is all over. We used to go different places, and always went to Arthur Murray Studio to take lessons.

Lin: Like Hawaii.

M. Lin: They can transfer their lessons. We went to Honolulu, Chicago, New York. Everywhere we went, we visited one of the studios.

Lin: And here in the Bay Area, there's a teacher who is very good--

M. Lin: Jim Meyer.

Lin: Jim Meyer, the owner and teacher of Arthur Murray, noticed Margaret so he asked for Margaret to dance with him for exhibits. Must be over twenty, thirty times, maybe, eh? How many times was that?

M. Lin: Not. Not that many. Because one day, I finished my hours, so he said, "You know, your hours are all used up. And now I can't teach you. If you go out with me for dance exhibition, I don't charge the fee."

Lin: Yes. Free. She got free lessons.

M. Lin: Free. So I said, "I'll ask T.Y." I said, "All right, I can go there, but I want to know the place. Only good place? And besides that, my husband always goes with me." "Sure, of course! I'll always ask you about the place? I will let you know." So I think I probably take about, I don't know how many lessons, from 1965 to 1970, I think.

Lin: More, I think.

M. Lin: From '65 to '70.

Lin: But one evening, they were making a show at a club somewhere--

M. Lin: I think, Kiwanis Club--

Lin: They have meetings there. One day, I was chaperoning her and they were exhibiting a dance, and one of the gentlemen, you know, said "Oh, you are chaperoning your daughter, eh?" [laughter] I said, "Yes". I said, "Yes." She looks so young, you know. He said, "Yes, she looks like young little girl." So she dances very well.

Swent: Did you belong to dance clubs here?

Lin: No.

M. Lin: No. We don't belong to any clubs.

Lin: Usually we danced at home. But I stopped dancing since last year, since one of my knees is weak--[pats his knees]

Swent: Just last year? But you did until then?

Lin: Yes. I can't dance as much now.

M. Lin: First, when we both dance, and we did one competition, with you. [speaking to T.Y.] We, two, together dance.

Lin: In Florida?

M. Lin: No, no, no. Here. Here. We danced a foxtrot.

Lin: We also danced competitions together.

M. Lin: Yes. Once.

Lin: But mostly with the teachers. One teacher wants to dance--

M. Lin: Then later, because different teacher teach different routines. I used to practice with T.Y. using his routine. Because I can always follow, though I don't remember my own routines. But T.Y. loves Viennese waltz, waltz, et cetera. I always follow him, doing his routine. Now he doesn't remember his routines anymore.

Swent: I remember seeing a picture of you years ago in the paper.

Lin: Yes.

M. Lin: Right. Long time. We both danced there. That's many years ago.

Swent: With your coattails flying?

Lin: [laughter] Yes. Then we had a competition.

M. Lin: That's, I think that's "California Living" [magazine].

Lin: Yes! Front page I think! Later, we had an engineer's conference for a few hundred people. And they had a dance competition. So we went out, and we won the first prize. But they all laughed at T Y. "You! We didn't really vote for you. It's Margaret." [laughter]

M. Lin: That's in Florida--

Lin: Florida, yes.

M. Lin: Miami.

Swent: So you did your dancing mostly at meetings, conferences, that you had been to?

Lin: Well, very few.

M. Lin: No.

Lin: But, she, most of the time, with Arthur Murray and parties in their competitions.

M. Lin: Yes. Before I joined the competition, I was so nervous. Every time competition, I always lost a few pounds. So I had a little blood pressure. So my doctor said, "Dancing's okay. No competition." So from then on, I don't compete. Then I did showcase. Showcase, about every six months, you do your show.

Lin: Just show up--

M. Lin: Show, you have with your instructor, who prepared some kind of routine, tango, waltz, et cetera.

Swent: That's just for other students?

M. Lin: Yes. For all the studentse. You had the show, and then you had the evening dinner with a whole group of dancers.

Lin: Arthur Murray organized very well. But now, it's a different setup. Most their teachers left and establish their own studio.

M. Lin: Yes. And because Arthur Murray charges more than others. So most teachers from Arthur Murray left to set up their own studios. You don't pay that much. But now, I pay $45 for one hour. Usually I pay for a month, about eight lessons. If you pay every time, individually, then you have to pay $50.

Lin: The Arthur Murray studios may charge $70 now.

M. Lin: They probably do.

Swent: It used to be four. When you started it was four dollars a lesson and now it's fifty?

Lin: Yes. That's then and it's higher now.

M. Lin: Also four dollars were just for an ordinary teacher, once upon a time.

Swent: Have you ever taught?

M. Lin: No. Never. I cannot teach.

Lin: We hold some informal teachings for others professors at our home.

M. Lin: Oh that's--just have fun.

Swent: You invite friends in for dancing?

Lin: I can teach but I cannot dance too well.

M. Lin: He can teach anything. Swimming, or dancing. He always say, "I can do this. I show you how to do it." I cannot. I can only follow.

Lin: She's timid, and I'm very brave. Even when I was student here, I had no money. So I worked, but in students' apartment. Four students hired me. So they ask me, I was something like eighteen years old--I began here. They say, "Can you cook?" "Oh, yes! Chinese cooking!" So I worked for them for a week. First day, my fried eggs was all dark, sooted. After one week, they say, "Lin, you are very good, but your cooking is so-so." [laughter]

Domestic Life in America: Cooking, Crafts

Swent: Have you ever learned to like cooking, Margaret?

M. Lin: I don't like cooking. But I can do it for myself.

Lin: She's okay.

M. Lin: That's why when we came here, T.Y. all his life, he wanted silverware. He wanted to get the silverware for home parties. But I'm not a good cook. I don't like parties. So I never bought that thing. He's disappointed. [laughs]

Lin: So we decided to invite our guests outside, for about twenty, thirty years we been here, we always invite our office guests outside to the best restaurant in San Francisco, Blue Fox and so forth. But now we don't do that any more. We don't invite often. She cooks reasonably good.

M. Lin: I cook because he has to stay home and eat. I learn my cooking here. He has a cousin Tung Mei who used to live in Palo Alto, when we came here. Every time I went to Palo Alto, I learn one dish and come back, and I work on that dish. Now this cousin passed away already.

Lin: She cooks quite okay. But most Chinese wives cook better.

M. Lin: And the thing is that I don't like the meat cutting. The Chinese, usually when I try to cut something, I want you to do that right.

Swent: That's the hard part of Chinese cooking.

M. Lin: My sister is very good in that. Sometimes, something I like, I ask people how to do it, then I tell my sister. She cooks, I eat.

Swent: Is your sister still here?

M. Lin: Yes, Yvonne Wu.

Lin: Yes. Younger one, not the older one.

M. Lin: That's the one that now lives in our old house. That's younger sister. I'm the between. I'm in the middle.

Swent: And the older one is still alive, is she?

M. Lin: Kay passed away.

Lin: Died.

Swent: But she was stronger after your adventure--

Lin: [laughs] Yes! Stronger! Very interesting!

M. Lin: She's very good. She's very outgoing. And good cook too.

Lin: She's the artist.

M. Lin: She knows how to social with people. I don't. [chuckles]

Lin: That small figure, she made that, over there--

M. Lin: That's her work, the statue--

Swent: Oh, the sculpture.

M. Lin: And in my bedroom, there is a painting.

Lin: Her elder sister.

M. Lin: My father is very good in painting. He wanted me to try to paint. I said, "No, I don't like it."

Lin: Margaret is a dancer.

M. Lin: I do other things. I do all the handicraft. Because I don't like to talk. So I just, when I came here, I took all the courses. I did lampshade, carpet, and enamel jewelery, flower arrangements, and making fiber flowers, and leather carvings.

Swent: Where did you take these classes?

M. Lin: I took all those at the Adult School.

Swent: Berkeley Adult School?

Lin: Contra Costa College is one, huh?

M. Lin: Oh, Contra Costa College is where I took sewing and tailoring.

Swent: Where is that?

Lin: Nearby. Somewhere in Richmond.

M. Lin: Down there along San Pablo Avenue.

Swent: Did you ever take anything at the university?

M. Lin: Yes. [laughs]

Swent: What did you take there?

M. Lin: I took Russian and English. My Russian got very good grade. My English only got C. Because when I took English, I took Subject A. When this exam, has ten topics. I only understood four. She asked what is 4-H club.

Swent: Oh, of course you wouldn't know that!"

M. Lin: She said, "Why you took subject A?" I said, "For fun." She said, "You should take English for Foreigners." I didn't know that. Subject A was good for me.

Lin: She's supposedly an alumni of College of Letters and Sciences.

M. Lin: Yes. Listen. Because I took some classes in '48. So all the time, they send me this 'Reunion for Class '51'. [laughter] They put me in '51. I feel younger! But I didn't dare go in there. I don't know what to talk with them. I never went.

Lin: I'm class of '31. So I'm twenty years older. [laughter]

M. Lin: I'm '51. Hey. I like that!

Russian Language Studies

Swent: But then you took Russian.

M. Lin: Russian because when we were in Lanchow, when I had Paul there with us. Since I didn't graduate from college, because I married and was having Paul. I also never worked outside. That's why I don't know how to talk to people. [laughs] So in Lanchow, we have a neighbor whose mother-in-law came from Russia. Since our house was just across the street from hers, one day I went over and asked, "How about learning some Russian?" She said, "Yes! Sure. Why not?" I took some conversations with her. After that, I came over there to learn Russian. Then in '58 we went to Russia. After I came back, I said, Oh, that's pretty good. Then I kept on going, and went to the Berlitz School. For one year. Then I even wrote composition in Russian. Now I don't remember anything. [laughs] That's long ago.

Swent: But you did learn it?

M. Lin: I did learn it. Very interesting.

Swent: Did you travel again to Russia?

M. Lin: No, only that once. '58. I told T.Y., "Any time you go to Russia, I'll go." Because I can learn more Russian.

Lin: Her Russian pronunciation is very good. Real Russian. Because of that lady.

M. Lin: That lady.

Swent: Did you learn any other languages?

M. Lin: French. But I didn't learn very much.

Lin: Two years of it.

M. Lin: I didn't pronounce French well. Russian I really followed the rules. I had friends who were Russian majors.

Swent: Had you studied English in school in China?

Lin: In China, yes.

M. Lin: In China, yes. Just some reading, grammar, et cetera.

Swent: So you knew some English when you came here.

M. Lin: Yes. A little. I can understand better than talk. Here I only listened to the radio. Radio shows, I remember when I came here, one was "Guiding Light", now still on [the television], but I don't watch it.

Lin: Right at the beginning of forties or something.

M. Lin: That's with Helen Trent. That's a long time ago. So one year, we came back from Europe. Paul said, "Mom, your soap opera, Helen Trent, quit. They don't have any more!" [laughter] That romance had started from '35.

More Movie Stars

Swent: And the movies. You had gone to movies in China, you said.

Lin: Oh, yes!

M. Lin: I did.

Swent: In Shanghai? You went to American movies?

M. Lin: Yes. In China we saw a lot of movies.

Lin: They showed mostly American movies. They showed in Shanghai theater, and Nanjing theaters. American movies were very popular.

M. Lin: I remember I saw the "Great Waltz" in Shanghai. Great Waltz. Very good.

Swent: The Great Waltz--that was a movie that combined your love of movies and dancing.

Lin: Yes. We loved the movies.

M. Lin: Because of the movies, I thought United States was very pretty. I love to see these people dressed up. [laughter]

Swent: When you came here, was it a big disappointment?

M. Lin: No. When I came over here to see the movies, try to see the movie stars--I felt great.

Lin: When we came to this country, I think it's because she wanted to see movie stars. [laughter] Yes. She told me, "T.Y., I want to see movie stars in person."

First thing we did is to go to Hollywood, and to see all the movie stars. We also met several of them enroute traveling.

M. Lin: Traveling I saw the movie stars. I always went over to ask for autographs.

Lin: Yes. For Barbara Stanwyck and Ginger Rogers.

M. Lin: That's over here. But over in Europe, I saw Yul Brynner in Vienna. We had the same restaurant for dinner. I saw Yul Brynner, so I said, "Hey! The King is there!" So I went over. I ask for autograph. In Madrid when we came back from Belgium, we stopped in Madrid. I stayed in a hotel with Bette Davis, Robert Stack over there.

Swent: And you got their autographs too?

Lin: Yes.

M. Lin: They are in front of the hotel. They're talking. So Robert Stack, when I talk to him, he was on the phone. I didn't mind. I went over, "Hi! Are you on the 'Written on the Wind'?" He said, "Yes!" "Can you autograph for me?" He said, "Yes! I am just now, I am just talking to my wife. She just gave birth to a baby boy!" So I knew, maybe, his age, the baby boy. Because '54! Then Bette Davis, I saw her in front of the hotel. I saw her. Bette Davis was very short, but talked a lot.

Lin: Talk, talk, talk, talk.

M. Lin: So I went over, and I waited for a long, long time. Still talking, I cannot cut in. So finally, I sit down right in front of the hotel. But she's very short.

Swent: So you're not so timid when you really want to do something?

Lin: [laughter] Exactly! Exactly!

M. Lin: This I really want! But I was scared. Very scared.

Lin: Who's the movie star we met in Rome?

M. Lin: In Rome was Elizabeth Taylor. Elizabeth Taylor and Richard Burton.

Lin: Yes. Yes.

M. Lin: We went to that city. They were just shooting this film "Cleopatra".

Lin: Cleopatra.

M. Lin: I think it's in sixty some, huh? I remember that day I saw Elizabeth Taylor when, she, maybe only twenty-nine years old. So I said, "Ah! I want Elizabeth Taylor's signature." So the men there said, "Just a minute! I'll ask her for this. Because just a few days ago when they shooting this picture, some senator--

Lin: From the USA.

M. Lin: --from the USA to watch them. Elizabeth Taylor got mad, and didn't want to meet him. So let me talk to her about it." Well, later, this man talk to her. And when we are having lunch in the garden, Elizabeth Taylor and Richard Burton, still on their costume, walked over there. She already signed this autograph for me. So I look at her; he looked over here; she smiled; I smiled. But I didn't ask Richard Burton for the signature. Same thing as Robert Taylor.

Swent: You passed up the chance.

Lin: [laughter] Met all these movie stars while traveling.

M. Lin: And another movie star when we came back from Rio.

Lin: Rio. Rio. Yes.

M. Lin: That's Sammy Davis, Junior. Because we waited there and the plane won't start. They said have to wait for somebody. Finally, that's--

Lin: Waiting for him! [laughter]

M. Lin: --him. He came out with another three or four blacks. The Junior just a little bit. Yes. So I walk over, I took a postcard, I said, "Will you signature for me?" He said, "Yes." He was still talking to all the people. I waited for a long, long time, because he tried to draw.

Lin: Draw, you see!

M. Lin: He took a long time. I put into my pocketbook. He sign all over. It's like a puzzle. He did that and took some time.

Swent: Well, that's an interesting hobby to have. You've had lots of adventures!

Lin: Okay, so any more questions?

Swent: Oh, I think that's good.

Lin: That's good.

M. Lin: You want some more tea? Okay. I can get some hot water.

Swent: Oh, that would be nice. But you haven't had any yourself.

Lin: She talks much better than before, she's getting improvement.

M. Lin: My broken English--I can talk. If those kind of stories, in Chinese is okay. In English, I got stuck.

Lin: The grammar--

Swent: Her English is excellent, very good. I have no trouble with it at all.

M. Lin: Sometimes, I think about. No, I don't want to say anything because I got stuck. [laughter]

Swent: Whose voice is that on your answering machine? Is that Verna?

Lin: Yes. Yes. Yes. [referring to Margaret Lin's story] Very interesting, huh?

Swent: Very! Yes! But she didn't want to be a faculty wife.

Lin: Well, okay. At least, faculty is reliable. I think, whoever made a survey, the best husbands are either an engineer or a professor. So I qualify both.

Swent: [laughter] Did you ever socialize at all with the other faculty wives?

Lin: Some close ones, on the--

M. Lin: Not too many, I don't think. Here are two things. One thing is, I cannot socialize with people; I don't talk that much. Another thing, every place you have to drive.

Swent: And you don't drive?

M. Lin: I do. But, I don't, sometimes if I go--

Lin: She likes to have a chauffer--

M. Lin: No, I like to go with somebody. So, I joined the Femineer, an engineer wives club. They had one lunch every month. So this lady always talk, talk, "Margaret, I'll pick you up!" Then I go. [laughter] But usually, I never started something. I'm very good in following. I'm a good follower. I can do something, if somebody tells me what to do, then I do it.

Swent: Do you have women friends? Other than your sister, and--

M. Lin: Yes.

Swent: How have you made those friends?

Lin: Not too many here.

M. Lin: I don't--and besides because my sister and me together all the time, and always do things together, just--

Lin: Yes. She's too close to her sister to make any other friends--

Swent: What about your children's friends? Have you made friends with the parents of your children's friends? Through school? Have you done anything with PTA or any of those things?

M. Lin: PTA. Not much.

Lin: She has several ones through Femineers, the engineers' wives.

M. Lin: Even Femineer I try to go, try to push myself to go. It was not that interesting. I'd rather go somewhere and take lessons.

Swent: Yes. You take a lot of lessons.

Lin: She learns. By seeing. By watching. She doesn't like reading. She cannot get as much from reading. See a movie. See some instructions for dancing--

Swent: Visual.

Lin: Visual. Visual.

M. Lin: No, because I always do something with my hands, I love it. I love demonstration. If you want me to read something, to follow that, I'm not good at all. I had a teacher try to make flowers. This teacher already passed away now, Monica. I went to study fiber flowers, then to make flower arrangements. Then one day, her friend come to the studio, and Monica just said, "See, this is Margaret. She doesn't talk very much. But she listens. She learns everything from listening. She always does a good job, she works on everything here." After all this, she say, "Margaret?" I said, "Yes?" "Did you hear me?" [laughter] I said, "Yes." "Well, say something!" I said, "Thank you!" [laughter] That's me!

Swent: Well, different people learn in different ways.

Lin: Yes. Yes. And I cannot see anything with my eyes.

##

Lin: Well, what time we have now?

Swent: It's quarter after 11.

Lin: Oh, it's okay.

Swent: Do you want to talk a little now?

Lin: Sure. Sure. Sure.

Swent: Thank you, Margaret.

M. Lin: Thank you! I took too much time!

Swent: No, you didn't at all.

VII TEACHING ENGINEERING

"I Teach It From the Heart"

Swent: All right. Well, let's continue. I was going to ask you a little more about your teaching and maybe that fits in with that idea that different students learn different ways. And engineering teaching. I noticed in your papers, there at the Bancroft, there are no papers from your teaching. Do you have those papers anywhere?

Lin: No. Not about teaching. I don't know if I have written anything about teaching.

Swent: Or kept any of your lessons?

Lin: In fact, I have so many notes, there were boxes of them. All thrown away now.

Swent: How did you go about teaching?

Lin: Okay. My basic theory in teaching is to understand the stuff myself. If I really understand it, then I can always convey it to the students. And, apparently my English was not that good. One of my old students, forty years later, come and told me, "T.Y., when you talk, I didn't understand your English." It's not that bad. But occasionally it was.

My teaching was successful in a way because I teach it from the heart. I think most professors do anyway, you see? So, I knew the subject well, and much of the subject, I started myself. Take the case of prestressed concrete: most of the theories, formulas, reasoning, and methods were derived personally. So as a result, apparently, I talked quite well. Occassionally I made mistakes in class. And at least one of the students will catch me. I doubt that I ever got by, making a mistake in class. They all looked at me. And usually I encouraged this kind of thing.

There were several times, visitors from foreign countries in my class, particularly from Europe, Germans and others. They said, "You conduct a class like a conversation." So I asked the students, and the students answered back and asked me questions. Okay? Not like the European way, where the professor went up and put on the blackboard and the students copied. So, I sort of conversed with them, and that made me good, I think, as far as teaching.

Swent: How do you go about--designing a bridge, for instance, do you build a model of the bridge first?

Lin: No. I never did. No. No. I'm no good at building models. But when I talked about a bridge, it's the basic essential elements. Basic theory of mechanics, materials, and bridge parts. And how bridges are put together. This kind of thing.

Swent: This would be the same for a building, I guess--

Lin: Same thing.

Swent: --as a bridge, wouldn't it?

Lin: I think I became good in teaching because later on, I studied all this prestressed concrete. It's all my own material so I can do a good job. Yesterday, in my talk to Chinese Christian Church, the one who invited me was Edwin Lee. He was one of my students, forty or fifty years ago. And then there were several others who were in my classes, and we took some pictures there. So, apparently I got along with the students quite well. Quite well.

T.Y. Lin Associates: Former Students, the Arthur Murray Model

Swent: Did some of your students later join you in your company?

Lin: Yes. In fact, the company was made up, most of them chosen from my former students. The first one, was, of course, Edward Rice. He was in my class, and then he knew I started prestressed concrete. So he approached me and I work with him to set up T.Y. Lin Associates in Los Angeles. He managed it very well. He's a business man, really. He got all the jobs. I didn't do anything. He managed my company for some fifteen years. He did the whole management. Got all our clients. Set up in Los Angeles. That's one student.

Second one, was Felix Kulka, who took my course on prestressed concrete at UCLA. Later joined me as the second president--

Swent: You taught at UCLA also?

Lin: Only extension classes. Yes, I did teach there.

Swent: I see; you went down there?

Lin: Yes. I used to fly down, you see, to teach on Saturday or whatever, and came back shortly, so I taught here. And occassionally, I'd teach a course in UCLA, essentially on prestressed concrete. Now that student, Felix Kulka, was very good. He work with me. He was helping Rice in charge of my office. Then he moved up to San Francisco about fifteen years later and work another fifteen years here. He passed away now. Then, I had these, both partners were my former students. Then, I had Chuck Seim, important bridge engineer here at T.Y. Lin International and lots of my other students--Seim was a good engineer but not a boss, nor a manager. Since about 1975 my firm was managed by Y.C. Yang, who is still with me. He is not my student, but my old alumnus from China.

Swent: He's of your age then?

Lin: About six years younger.

Swent: And he's still managing.

Lin: Still with me now. Now, my firm is very, very small. So, before, we build the firm up to 550 people throughout the world. I learned part of this from Arthur Murray, where I took dance lessons. Arthur Murray had set up maybe hundreds of dance studios. And I must have set up more than a dozen T.Y. Lin Associates all over the country and the world. But, I left them alone, to run themselves. I owned nothing, and they paid me no royalty. It's very interesting to me, because I carried my teaching into the profession.

Swent: They used your name?

Lin: Yes, they used my name. Only when they need me to travel to help them, they pay me first class travel and expenses, including my wife's [expenses], but still I got no hourly pay. I figured I got enough money anyway, so finally I sold my firm, T. Y. International, under the ESOP plan. You heard of that? Employee Stock Ownership Plan. I shared my firm with people like Ed Rice and Felix Kulka, something like fifty-fifty. Because I feel that is a good way for them to manage all the troubles. And they were very reliable. I get 50 percent, but still that's more than enough because I taught at school, and the money I made for the firm is not really all my work, you see. It's more than enough for me to spend anyway.

Swent: But your name is very valuable--

Lin: Even now it's very valuable. So I sold the firm to the ESOP plan, which gave it to the staff around 1985. About two years after that, they resold it for six million. Which is not that bad. But the buyer paid back only part of the money. Now they are still in a lawsuit.

Swent: Oh, dear.

Lin: That's terrible. I was paid half million from the ESOP plan, and paid $200,000 tax, invested $300,000 in stock. So I'm okay. And that's enough for me! Because I did the work for fun. I felt that I contributed to society, mankind, university, and so forth. So I enjoyed it a great deal. Many of my students are still there, in fact all over the world.

Swent: Yes. Having been a student of T.Y. Lin gives somebody a big advantage.

Lin: Yes, yes. Unfortunately, the stock I gave them, they only got half paid by the purchaser, who cut away the other half. Now the two parties are still in the lawsuit. Terrible!

Swent: That's a shame!

Lin: Terrible! Terrible! Well, anyway, now: to build up the business, I figure out, that I am essentially a scholar, scientist, engineer. But I'm not good as a manager. However, I'm in fact quite good, because I know how to delegate. I delegate to my people and I never ask them any questions. I never looked at the books. I was paid no more than $50,000 a year. It's more than enough because I got salary from the university. Now the university has a rule, I think I told you before, that you can do outside work without impairing your university duties. So I was very careful. I work very hard at the university. Never short of serving the university. So I got along with the university very well. Then, in addition, because I started prestressed concrete, which was a new area, that gave the university a good name. So the university is very happy about that, and that made me very happy. So if I were to work just for money, that's a different question. But I got so much money, I think, it's enough for me! It's nothing compared to any millionaire. For example, my friend Rice, he owned at least a few hundred million dollars. I think.

He was a major owner of seven blocks in downtown Sacramento near the capitol. See. So he's very well off. Apart from our professional practice, he knows how to manage real estate. I don't do that. But I got enough for myself anyway.

Swent: Were you able to bring problems, that is, engineering problems, from your business into the classroom?

Lin: Very much. Because when I have outside practice, I work on new buildings, new bridges, and new nuclear reactors, and other things. And these were brought back into the class when I taught a course on prestressed concrete. So actually, I sort of in a way, integrated it and helped one with the other. Yes. So I had no trouble with the university. The university valued me very much and I valued the university. Now take the university laboratory. For several years I served as director of that laboratory.

Directing the Engineering Materials Laboratory

Swent: Which laboratory was it?

Lin: Engineering Materials Laboratory in Davis Hall at school. It's a very big laboratory. I did lots of experiments on prestressed concrete.

Swent: How do you do those?

Lin: Okay. Most of them were sponsored by outside people. I think, a great deal from California Department of Transportation, California Architecture Department. They all sponsored when we studied a new prestressed concrete floor, or a column, or a building frame. And they paid for that. Usually I organized a program, they sponsored them. I got the job and ran these tests. And this was very important--

Swent: Do you actually build a miniature column or a miniature--

Lin: Yes. Yes. Lots of them tested at the university in the laboratory. The state offices paid the money to the university. The university gave it to us to run these tests. And then we wrote report and so forth. So, it benefited the university, the profession, and ourselves.

Swent: Could you describe, because this is a historical record to keep for years, describe the physical laboratory?

Lin: The physical laboratory is a very big one. It's called Davis Hall. Davis Hall is a big building near the Hearst Mining Building. There was an old Davis Hall, which was torn down for a new Davis Hall, built during 1960s. I had a part in getting the money from the federal government to supplement the building of the new hall. It's a big hall for a laboratory. The main part is the floor, which is something like 50 feet by 200 feet, open floor! And the floor itself is a machine. When we were to test a small bridge model, we bolt the bridge to the floor and break the bridge apart, one against the other. The floor is so strong that it will never break. So the bridge eventually will break. That's a very well-known laboratory throughout the country and the world. Actually, as I said, the new lab was financed when I was chairman of Structural Engineering. Then the federal government looked at the old one, and put up money for the new one, maybe five million dollars, which was a lot of money at that time, you know! It's a very good laboratory. In it we made all kinds of structural tests. They still do a lot there now. I managed it as head of the laboratory and I ran many tests therein.

Now, I learned a lot of this from Belgium at the Magnel Laboratory, University of Ghent. His laboratory was almost as big as ours. In fact, I did research there because of that laboratory. So for one year there, I worked upstairs in that laboratory, and when they break some beams or columns or what, I would go down there and compute, to expect how much force it will take to break that thing. And usually it came out within a few percent. So I learned a lot of theory and actual action of all those prestressed concrete elements in that laboratory. Then I came back and worked at Berkeley university with the sponsorship of others and tested many things. So many designs or even theories of prestressed concrete, elements and structures, were developed with the help of this laboratory. And that is the main reason why later on, Margaret and I donated our own 5500-square-foot building to the university. The valuation at that time, 1988, was $675,000. We retain the right to stay in it for our lifetime.

The Prestressed Concrete Home, Donated to the University

Swent: Your house?

Lin: Yes. It belongs to the university.

Swent: Oh, does it?

Lin: Yes. I didn't tell you that. Yes. Yes. It was about fifteen years ago. We figured out because I developed all this prestressed concrete. It's good for the university's name. But I used the university's laboratory! Indirectly, of course, the university also benefited from that. So we donated our house. We are allowed to live here and will have a lifetime occupancy.

Swent: I see. Then this house is also a demonstration of prestressed concrete?

Lin: Yes. And this house, itself, was built of prestressed concrete. So the whole house, 5,500 square feet had no interior columns, not even one. Just the walls supported by prestressed concrete slabs and beams all over the area. Our retaining wall in the back was prestressed. The whole house is essentially built of prestressed concrete.

Swent: And the exterior. It looks like brick but it is, actually, concrete stamped to look like brick, you said?

Lin: Yes. It is really brick, but it's sort of a concrete brick. They are hollow inside and filled with steel bars to provide against earthquakes.

Swent: That's the actual structure. Not a facing--

Lin: But these bricks are very interesting. They are supplied by Napa Basalt Company. Very well known here in this area. So we ordered all these bricks.

Swent: So they are bricks made of concrete--

Lin: Yes. Sort of. Yes. With holes inside so you can put bars up and down, right and left, through the bricks which you don't see from the outside.

Swent: And then they are laid together in courses with mortar?

Lin: Yes. Some of the walls were, I said, prestressed. Were tightened with bars. Vertically and pushed together.

Swent: Yes, I've noticed, this section of your front is concrete and then the end is brick.

Lin: Yes. Yes. Some are brick and some are concrete. The architect is Claude Oakland. He was the chief architect of this very well-known home builder, Mr. Eichler. His architect designed this house for us. Our engineer Y.C. Yang engineered the structure.

Swent: What is the roof? I can't see that.

Lin: The roof is all prestressed concrete; its slabs and beams were all prestressed and supported on all the outside walls.

Swent: And then, on the roof itself?

Lin: Roof itself is concrete, poured in place--

Swent: Flat?

Lin: Flat? Essentially, yes. But it also goes up and down for beams. Essentially, it's a flat roof.

Swent: What do you do about rain?

Lin: You see, concrete, when prestressed, is supposed to be waterproof, but sometimes it cracks. The roof does not leak. It's prestressed and then we have roofing on top. In addition.

Swent: Okay. Is that slanted?

Lin: No, the whole roof is flat. It's a flat roof. Oh, a little slant for water to drain by. But basically it's flat. Flat roof.

Swent: I was looking from outside, and of course, you can't see the roof, but I was wondering about that.

Lin: It's flat except for protrusions.

Swent: For chimneys--

Lin: Yes. Yes. And for skylights. But some of our walls leak. The brick is not waterproof. Particularly from the rainy side.

Swent: That's the rainy side. The west.

Lin: You see. A little seepage here. A little color. We tried to get rid of that for thirty years--

Swent: 'Efflorescence', is that what you call it?

Lin: Exactly. It is still there anyway.

Swent: So these bricks are the exterior bricks that are interior as well.

Lin: Exterior bricks and then there are exterior columns. See this one here? That's a column. That's a concrete column. See. All exterior. No interior columns. We spanned over with prestressed concrete slabs and beams, all laced with steel in certain directions. In other directions, it's not. It's laced this way, sometimes also laced that way, sometimes not.

Swent: But it's in tension?

Lin: The steel cables inside are in tension and tightened against a slab, so slab is being pushed together.

Swent: It's pushed laterally?

Lin: That's right. Not this longitudinal way. So we have two cracks here. [laughs]

Swent: Is there soundproofing?

Lin: No. Well, they put soundproofing material on the ceiling.

Swent: And you've had it how many years? You said thirty?

Lin: Thirty. Thirty-three years now.

Swent: And it's worn very well.

Lin: Yes. Yes.

Swent: Very good. It's very attractive.

Lin: The chancellor invited us to a party when we donated this to the university. Our kids were there. They were very happy. They are okay. They got their education. And they got to live their own life.

Swent: And they didn't want to live in this house?

Lin: No, they cannot live in this house, we figure out. And if we keep it, the government will take half of it anyway. So, we said, "Okay. Give to the university." We donated to the university. When donated in 1988, our house was worth $675,000. Now, it's worth over a million. Yes. Way over.

Swent: I'm sure. Way over.

Lin: Yes. The university has this rule, that you may live in it, and you must maintain it, and pay the annual tax.

Swent: That gives you a lot of security, doesn't it? That's very good.

Lin: The university is very nice to us, and the same we to university. We made all kinds of small other donations made to the university. We figure out, cannot take the money with you anyway. [laughs]

Swent: No, you certainly can't. No, you can't! Well, we need to talk about your bridges, but I think perhaps--

Lin: Time, time, it's time.

Swent: Next time. I did have one more question. When you're planning a bridge, do you have to go to the actual site first and visit?

Lin: Generally, yes. Because the environment would affect your design. Small bridges, I don't go. My colleagues, they handle those. But big ones, yes, I go and look at them.

Swent: You've had a lot of interesting travels.

Lin: Yes, we traveled so much! And as I said, Margaret always travels with me, take care of me and everything. And my firms, as I said, didn't pay me any money except when I travel to work for them.

Swent: Well, that's a good arrangement.

Lin: You see, basically, I taught at the university. That's money to live already. So whatever I make outside is extra. Which is good! I didn't really need that much more.

Swent: Okay. Well, I think perhaps it's a good time to stop. This tape is about ended.

VIII DEVELOPING PRESTRESSED CONCRETE TECHNOLOGY

[Interview 6: August 24, 1999] ##

European Initiative not Technological

Swent: This is our sixth interview, and you had said you wanted to talk today about the development of the technology.

Lin: That's a very interesting and important subject to me, because I really solved, personally pioneered, and developed prestressed concrete in the USA and somewhat abroad. The invention, however, was not by me. It was by Freyssinet, of France. Freyssinet initiated and conceived the entire technology in concrete. He thought, by prestressing the tendons of steel against the concrete, he put the concrete under compression, so that it will not crack as easily.

Then in Europe, during the war, this whole thing was developed somewhat. In fact, it was barely started. I had heard talks by European engineers at Berkeley along that line, in the early 1950s, '51, '52, and so forth. After some work on this I was given the Fulbright Grant to study prestressed concrete in Belgium, at the University of Ghent, Belgium, under Professor Magnel in his laboratory.

Swent: You have discussed that pretty well, I think.

Lin: I did mention it. And from then on, I came back home to America and started developing this. So I mapped out a strategy from the very beginning. It was, of course, modified during the development, but generally followed. First there's the idea which was Freyssinet's. But most European engineers and others never explained technology in terms understandable to the engineer or the scientist. They were quite mathematical, but never made the thing a technology. And I, being educated in America, tended to take the American approach. I tried to set the whole thing up in the order of science and technology.

Now prestressed concrete is related to reinforced concrete. So I joined the two into one. This I did, in the book, written while in Belgium. I had experiments conducted in Magnel's laboratory and wrote a few papers explaining prestressed concrete in terms of advanced modified reinforced concrete. That made engineers and scientists understand the subject quite well. Then I figured out ways to develop it.

Popularizing by Means of Conference and Textbook

Lin: But to develop an engineering technology is different from a pure science, because the product has to be economical. Otherwise, people will not use it. It had to be more economical than reinforced concrete or steel. That took me several years to do. Of course, at the same time, other engineers were also developing it. So I thought, to be economical in a technology like prestressed concrete, you need mass production. If you just make one piece, it's going to be very costly. But if you mass produce, things are standardized, materials, equipment are produced, then it becomes more economical. To popularize this idea, one thing I did, was the World Conference, which we mentioned, on prestressed concrete. Then, of course, my book was very important. My book on design of prestressed concrete structures. It's so understandable that it was translated into Russian, Spanish, Chinese, even Korean and Japanese, all over. I think neither the French nor the Germans translated it.

Swent: Really? How interesting.

Lin: I think, for some good reasons. The French thought they invented prestressed concrete. Why should they translate T.Y. Lin? That may not be the only reason, but it's part of the reason, I think. The Germans were too proud to translate an English book on that.

But later, many years ago, the French Construction Institute, which is their equivalent of the American Society of Civil Engineers, gave me the Albert Caquot medal. This highest medal was first time given outside of Europe. So I was the American, or the Chinese-American who got the honor about four, five years ago.

Swent: What was the name of the medal?

Lin: Albert Caquot, who was a pioneer of the discovery of land or something like that. Later he was honored by the civil engineers as an outstanding person, like we honored Columbus. Anyway, so we went to France to receive that medal, 1995.

Swent: Wonderful.

Lin: The Germans, they thought, Lin, Professor Lin was making the thing too simple; that can be dangerous. But unless it's simplified, you do not get popular support, you do not get mass production, and the science and the technology would never get to the world. So, my book was so clear to common engineers but based on absolutely correct and true science and technology. It was accepted the world over.

Organizing the T.Y. Lin Firm

Lin: Now, I have to put the technology into practice. To do that, I had to organize a firm. And being with the university, to organize a firm outside, can be a problem, if you don't do it right. But I started with the intention of pioneering a new technology, and proceeded along that line. As I told you before, I set up my office in Los Angeles, with one of my students, Ed Rice, in charge. Later on, it transferred to Felix Kulka, also my student. And we moved to San Francisco, some fifteen years later. Keep pioneering that technology.

Swent: I wanted to ask you just about the names. Did you begin as T.Y. Lin Associates? Was that your first company?

Lin: Yes. The name started as T.Y. Lin Associates. Later on, changed to Lin, Kulka, Yang and Associates. And later on, changed to T.Y. Lin Associates International. And then changed to T.Y. Lin International. By 1985, I quit the firm; set up another one, called Lin Tung Yen China, for various reasons. I did sell the original T.Y. Lin International to Dar Al Handasah, who ranked number 7 or 10 in the world of big engineering firms. With head office in London, they originally were from Jordan.

However there is a great story of the fight between the buyer, Dar, and the people who had all of our shares. As I said, I gave all my shares to my staff, for a half a million dollars. And Dar bought it for six million dollars, and never paid it all. They are still in lawsuit. That's a headache.

Teaming Up with Fifty-Three Producers of Prestressed Concrete

Lin: Now, as far as pioneering the thing, first, I teamed up--no, not team up; worked as consultants to pre-tensioning plants, who were producing concrete products in this country, USA.

Gerwick's father, Ben Gerwick, Sr., operated one of those plants. And Gerwick continued to operate them until he sold that, and became a professor and then set up his own consulting firm. At one time, as I said, our firm, T.Y. Lin Associates or International, was consultant to fifty-three such plants in the country. And Ed Rice managed our firm very well. He knew how to do that. So that really set the thing going all throughout the whole country.

And I figure out, that's not going to last very long. And, in fact, it did not last too long, because pretensioners soon learned all the tricks! They set up the plants, and they produced them, and after five or ten years they don't need me any more. But I was ready to jump to the next step. To work with post-tensioners!

Post-tensioners are those who produced prestressed concrete, manufactured them at the site, not in the plants. Because it took post-tensioning cables maybe a few hundred feet long to be tightened against the concrete. You cannot make it in a plant and transport it. So you do it at the job site. And that is very interesting. That required a lot more understanding of the theory to do it.

So we worked with post-tensioning plants. They wanted to design a building using beams, slabs, and needed consultants. So, I served as consultant to that. Ed Rice worked a lot along that line. And Felix Kulka continued later. So we worked with post-tensioning people.

Swent: I remember seeing a picture of the pagoda in Japantown in San Francisco--

Lin: Yes. Yes. The Japanese pagoda in San Francisco, Japantown, was originally designed using timber, the Japanese way. When it was ready to be built, they asked us to redesign it in post-tensioned concrete. The idea is mine, but actually Y.C. Yang carried out much of the job. My third partner, Y.C. Yang, and Felix Kulka also helped, but essentially, it's Y.C. Yang who helped design this pagoda.

Starting the Nuclear Containment Vessel Industry

Lin: Then, the theory was applied to many things, e.g., nuclear reactors. As consultant to Bechtel Corporation, I took part in several dozens of those nuclear containment vessels; that was written up in various papers. Actually, we started a whole industry in this. But Bechtel did the work. I gave the theory, as a consultant. I remember the first time Bechtel came to me, and ask, "T.Y. Lin, you know that. You help us design these things, brand new nuclear containment vessels." They pay me a retainer of $8,000. They overwhelmed me. Just a retainer, don't do anything, I get 8,000? So I accepted the job. But later on, they must have made $80 million or more out of that thing.

But anyway, I took $8,000. And I contracted on a time basis, something like $200 an hour. Which to me was good money at that time. That was some forty years ago. But that helped them develop the whole industry. And then their people wrote articles saying that we pioneered prestressed concrete nuclear containment vessels only with the help of T.Y. Lin. Which was true. Occasionally they got into trouble, I could identify the problem and made corrections.

But essentially, I began to work with consulting engineers. Bechtel is a constructor designer, more in construction. Because I helped them save so much money, they cannot build nuclear containtment vessels without using pretressed concrete. And I helped them develop the whole art and science of these vessals.

Swent: How did you test these things?

Lin: Oh. They actually put pressure inside. When they were supposed to take, say, 80 pounds per square foot pressure, they tested it to a hundred and so forth. Actually, these have been tested. In fact, the earliest ones were built and tested in France. The French built, not only containment vessels, but the nuclear reactors themselves, designed for say 200 pounds per square inch or something. They have tested some of these in Europe. And I also tried to pioneer that in this country. But it was not very successful. They probably built it better in steel. I think America has one or two of these nuclear vessels which house nuclear reactors with a prestressed concrete shell. It's very thick, say five foot or whatever. That did not become popular. But it was built, only one or two, I think.

The containment vessels become very popular. There are maybe over a hundred built in this country and other countries.

Swent: What did Chernobyl have? What was at Chernobyl?

Lin: Oh, yes, okay. Very interesting! So one day, maybe twenty years ago, now, I sat next to a Russian minister of energy at an international conference in San Diego. He said, "Since Chernobyl, we don't want to work on nuclear vessels." He didn't know to prestress concrete. So I asked him very briefly and he answered that Chernobyl had no containment. Aaah! That's the Russian way. We here are very careful. But Russians, they went in with no containment vessels; they just had a containment building, which collapsed like nothing under explosion. So they did not have containment vessels. Later, they must have built some, even, perhaps, in prestressed concrete. I'm not sure.

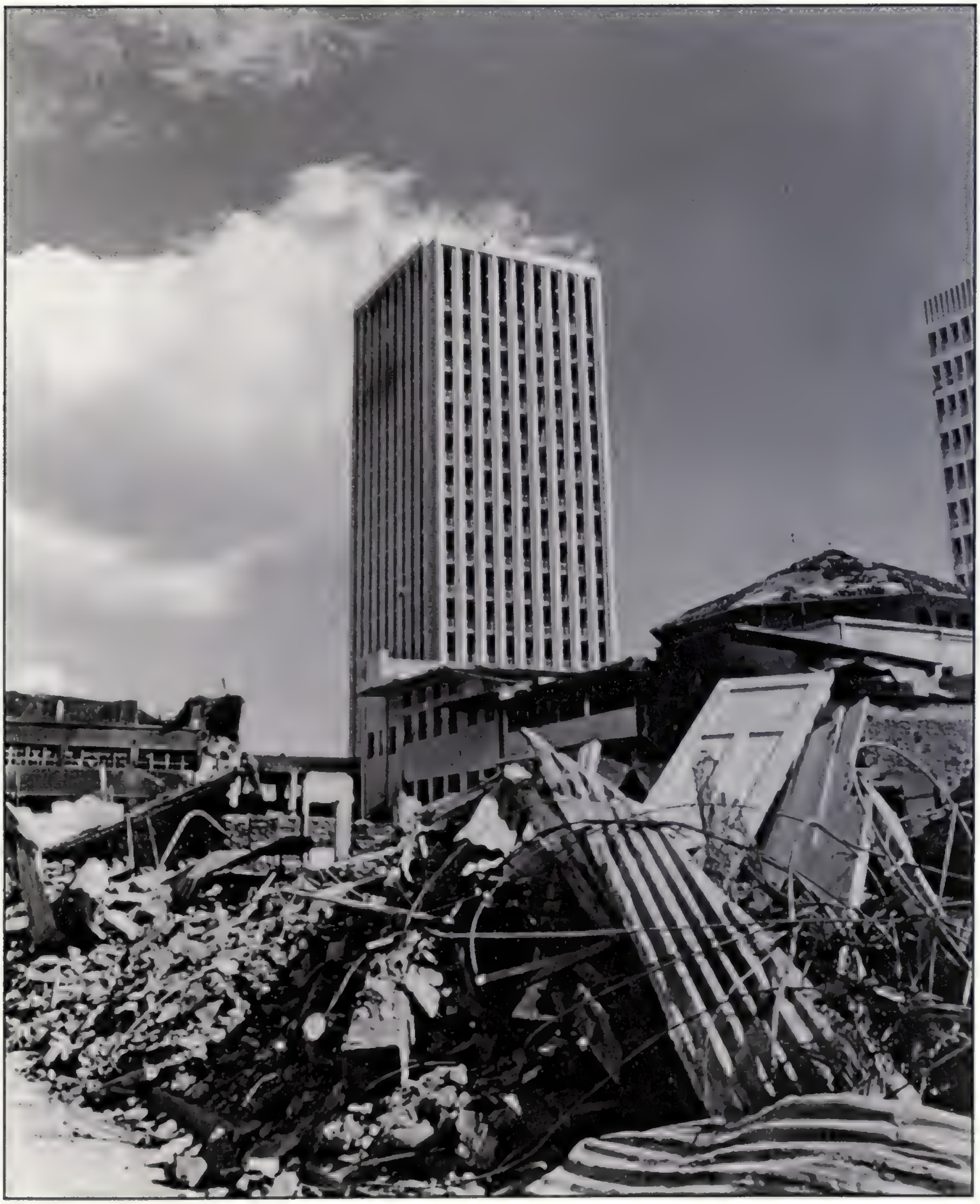
It's very interesting. The theory, I had. And how to do it, I knew. But actually, to do it, I did not have the manpower. Even to design it, it took Bechtel with a hundred or more engineers to do the job. And then they built it.

They were tested. Now, later on, they were not tested any more. Several of them were tested to more than the designed pressure. But I would run off if any actual explosion took place. It was designed, and I knew the design was so safe. If a reactor exploded inside, it would be contained. But still, there's a problem of how to get rid of the nuclear waste, I think. That's not my job.

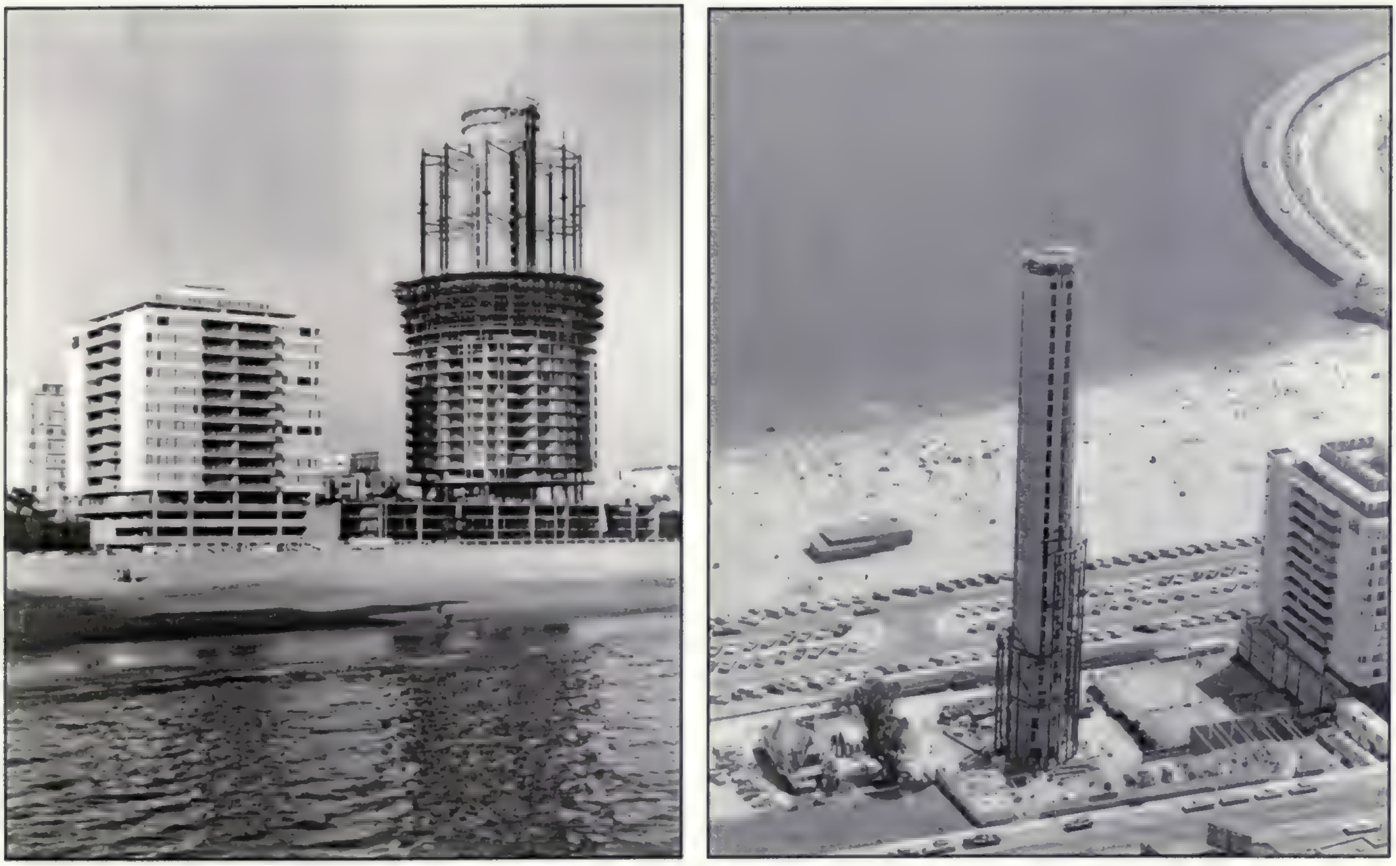
Building Bridges: Returning to a Previous Love

Lin: So, I pioneered and finally, after all these years, I arrived at the topic of great interest to myself, bridge building. First, built buildings, then bridges. That we'll discuss separately in another session. The buildings and then the bridges. But to get into bridges, it happens that I am returning to my previous love. You see, I wanted to build bridges, and now I found out, post-tensioning and also some pre-tensioning concrete is a great way to build bridges. So from then on, I took off on bridges. Also because, in buildings, architects are in charge. I only act as a subcontractor doing the engineering. Very important part, but I'm not in charge. I don't design the whole building. After the architect had conceived the building, I worked with them and designed the structure.

In bridges, I can do the whole thing. From initial conception, down to the design, detailing, and building. That is very satisfying to me. In the construction part, I usually work

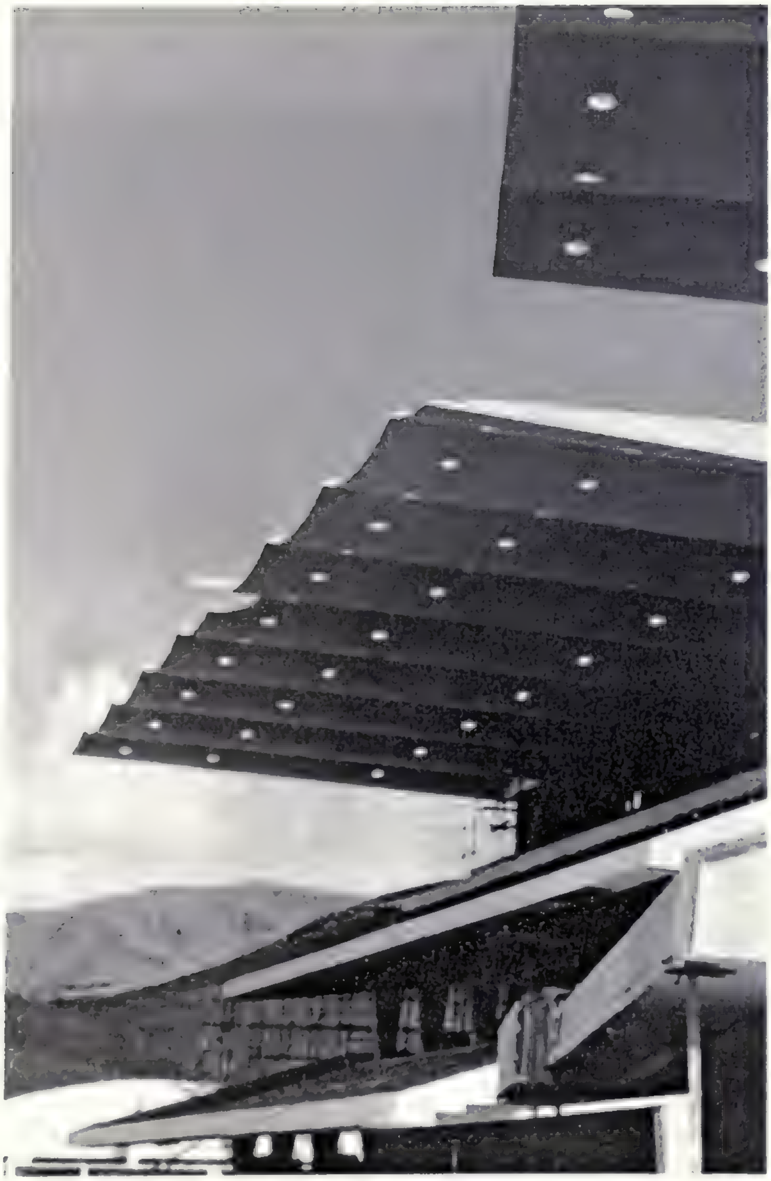


Bank of America, Managua, Nicaragua, following the earthquake of 1972.

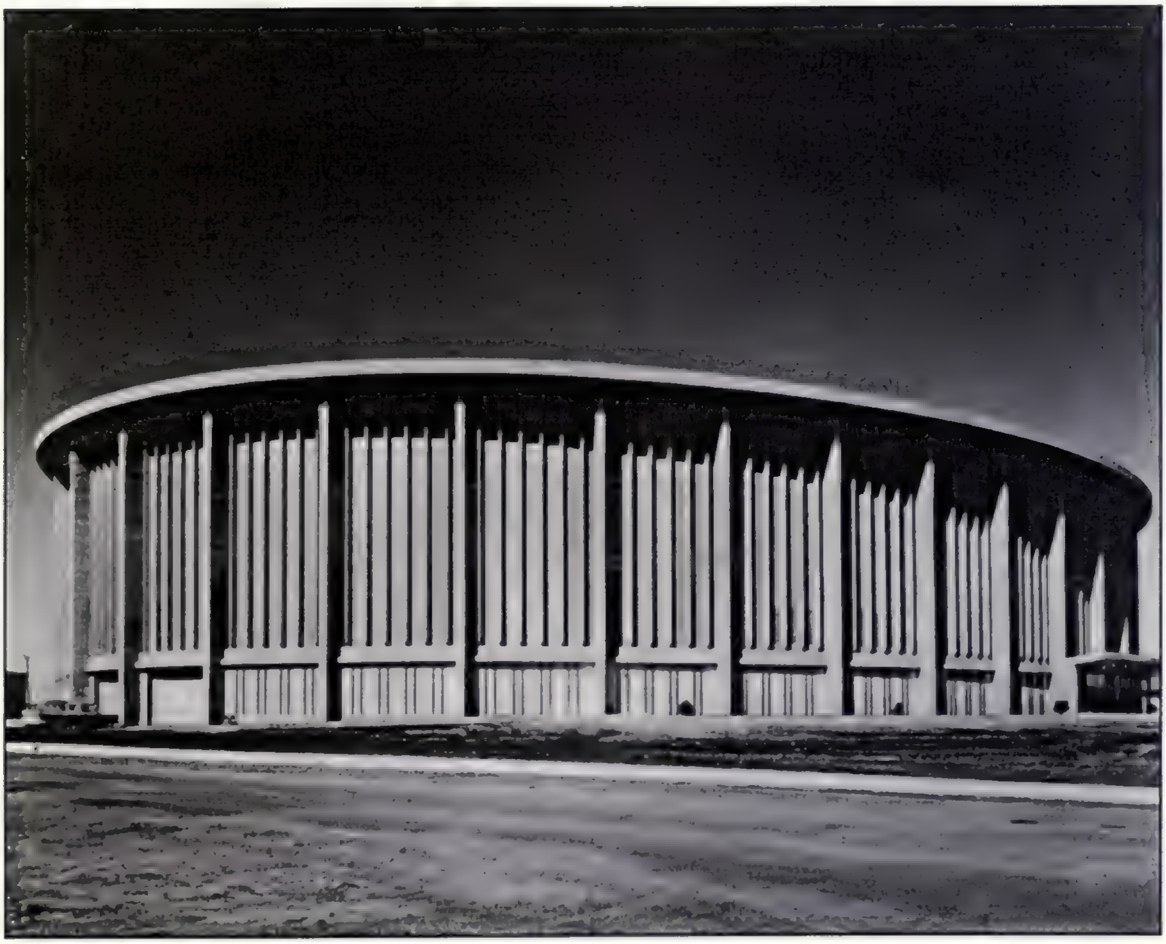


International Tower, Long Beach, CA. Under construction: central column for seismic strength.

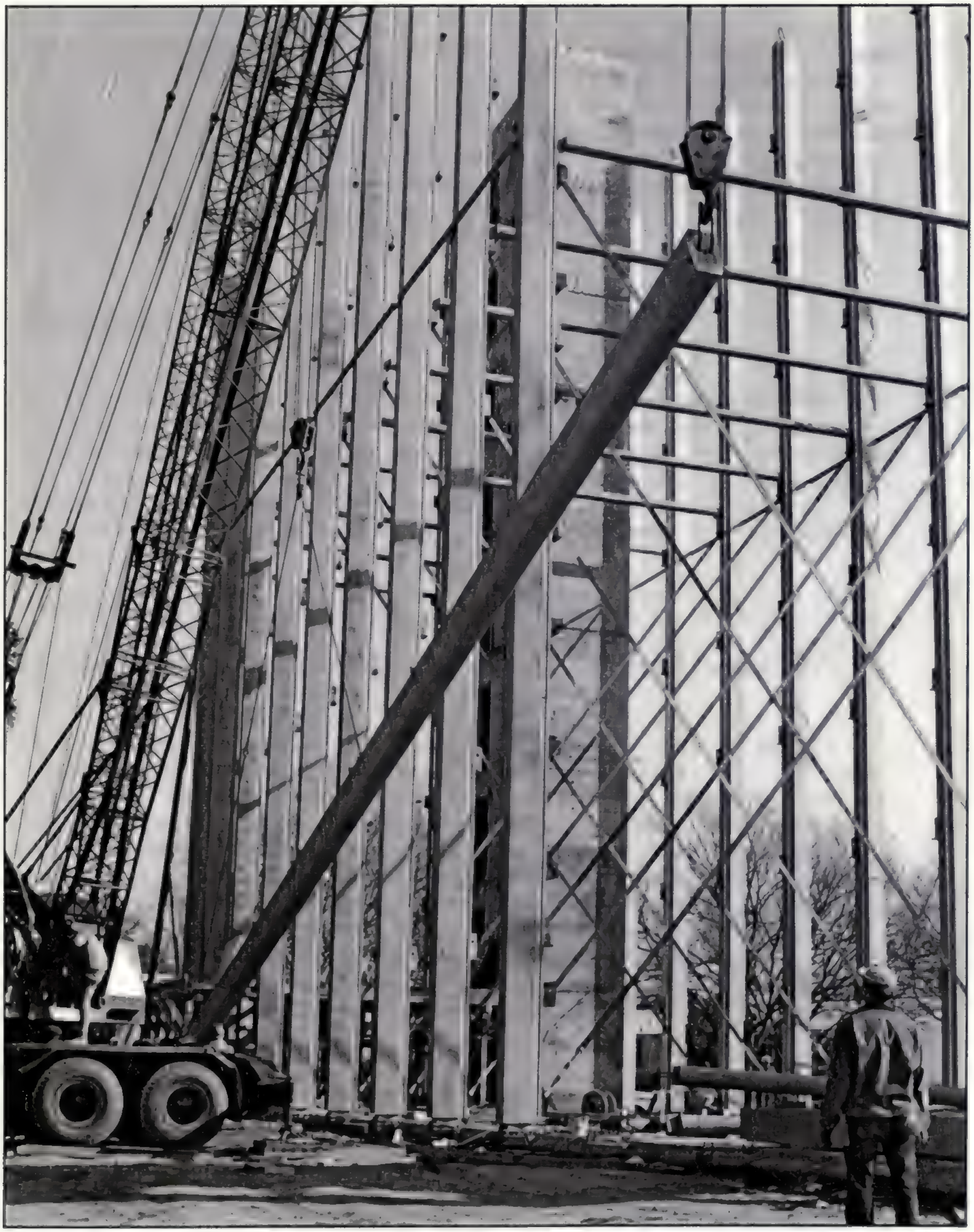
Photo on right by Aerial Photography, Pacific Air Industries, 1964.



Hipodromo Nacional, Caracas. T.Y. Lin and Felix Kulka, 1956.



Arizona State Coliseum, Phoenix. 400 feet in diameter.



Sproul Hall, UC Davis. Under construction: nine stories of all precast concrete.

as a consultant. I'm not a builder, not a constructor and I work with constructors a lot. My success in bridges actually was because I put all these together. From the basic concepts to the design, to the analysis, to the detailing, to the construction and supervision. Almost all the way through. So I think I am among the very few bridge engineers who do this, in this world. Later on, we will talk more on this a special subject.

Designing for Earthquake Resistance

Swent: I was just thinking, a propos of this terrible earthquake in Turkey last week, where they are saying that so much of the tragedy came about because the builders didn't do the thing right. And I'm thinking that no matter how grand your design, and how wonderful your plans, there still has to be a lot of minute supervision of the actual laborers that are doing it, doesn't there?

Lin: Absolutely.

Swent: If they don't put the thing together the way you planned it, then--

Lin: That's very important. In America, generally, they do put it together the way we have planned it. Occasionally, no. In some countries, the constructors are at a much lower standard. But in any case you must first design it right. In the Turkey situation, it was clearly because the initial concepts were based on very old building codes and method. Here, in San Francisco, we also have some brick buildings--unreinforced. No matter how you design it, it cannot be safe. Now in Turkey, I think they were partly modern, and built concrete buildings. Concrete buildings, either concrete walls or concrete slabs, floors, they can still collapse on you like pancakes if not properly designed. And that is what happened in Turkey.

The same thing happened in Tang Shan, China. Tang Shan was my former college site. I was there for four years. No earthquake. [laughs] And then, they had a big earthquake around 1970 and killed tens of thousands of people. Under the concrete slabs. Because they were not reinforced; there was no steel in it. Or you can blame the constructors who did not put the steel in the right place. That probably was also true. But basically, the thing was wrong! You cannot design a concrete building without steel. You have to design steel into it before you can build. Also if they did put steel in the wrong place and wrong amount, they got into trouble. I think Turkey is a very clear situation. People had no idea of earthquakes. So they just collapsed completely.

Now here, in California, we still have some of these buildings. But we are taking a chance; you cannot destroy all these buildings and rebuild them. But generally, our high rise buildings are steel, or reinforced concrete, very well reinforced; if prestressed concrete, very well prestressed. So they are reasonably reliable.

Swent: I understand you had a building in the Alaska earthquake. That was 1964. I read that one of your buildings failed in the Alaska earthquake.

Lin: Oh! That's not my building! Yes! Yes! I think that's a prestressed concrete building and I didn't design it.

Swent: You didn't design it.

Lin: Oh no, I did not! The building collapsed because of a totally wrong detail. Where the building, some ten stories, high tower, was connected to the foundation, they did not connect the steel correctly. So the steel bars were torn out from the foundation. Yes. That's a bad one. It was clearly a failure of reinforced steel in the concrete shaft. It was not a failure of prestressed concrete, although the floor slabs were of prestressed concrete. When the shaft collapsed, the floor slab pancaked.

That building failure was a bad one, which can be attributed to either wrong design or wrong construction. The steel bars should have been spliced to act together. They were not. I understand the failure was not in the prestressed slabs.

Swent: But it was not your design?

Lin: No. I had nothing to do with it.

Swent: Of course, you'll be blamed for anything with prestressed concrete in it--

Lin: Absolutely! Absolutely!

Swent: Everything with prestressed concrete is laid at your door, isn't it?

Lin: Yes. That's right. That's very possible. I remember the failure was due to the tower which was not connected to the bottom with the proper steel connection.

The Bank of America Building in Managua: A Seismic Success

Swent: What about the Nicaragua earthquake? In Managua? That was in the 1970s.

Lin: Well, I was very well known for that because that was my design.

Swent: Which one was that?

Lin: That's the Banco de America, Bank of America building, eighteen stories high in Managua, Nicaragua. Now, about 1960 some, they wanted me to engineer that building. There was an architect; I did the engineering. And it was known that Managua is an earthquake area. So I designed for that. I designed the eighteen stories building to act in two stages. It would resist normal earthquakes with no problem. But in case of large earthquakes, it may have cracks, but would not collapse. The first part was easy, to design against ordinary earthquakes; you put in enough steel. The second part is more difficult. And at that time, our knowledge about earthquake design was not that good. But I had the concept. Putting reinforcing bars--it's not prestressed, just reinforced--at some critical places, so that if they crack, the steel bars would still work. So I call it a second line of defense. There's more details to that thing. So I build in that building a second line of defense.

In 1973, an earthquake of a magnitude of Richter scale 6.5 happened. The whole city was leveled. And that eighteen-story building stood alone, though it cracked.

Swent: What was your second line of defense?

Lin: My second line of defense was that after it cracked, the building worked like a tree. A soft tree will move with an earthquake without collapsing.

Swent: Oh, it was flexible?

Lin: It becomes flexible.

Swent: How did you do that?

Lin: Well, I put steel in the right places. So I did that. Put steel at critical joints, and in fact, it cracked along these joints. But not enough to crack my bars. Concrete was cracked! Almost every story of the eighteen stories, at these junctions, the concrete cracked. But the steel was enough to carry it. So it moved with the earthquake. And then, the building changed from the quick movement, when it was stiff, very short period of vibration, to a slow movement, gradually, left to right. And it was resisted by the additional steel I put in. I put in no more than a few thousand dollars worth of steel. Very little. But at the critical points. So that it would be able to take that slow earthquake. You see, when the building first responds to the earthquake, it moves very fast. It cracks. After it cracks, it moves slower, and your added steel was able to stand it. This is fabulous. And it is not only in theory. We put in seismograph machines in the buildings to record any earthquakes. And the recording indicated that's what happened. Before the building cracked, it has a period of about one second [waves arms to demonstrate swaying]. After it cracked, the period changed to about two and a half seconds. Back and forth. And it survived. So actually, the seismograph records proved that to be true. And that became a very famous building. Professor Bertero of Berkeley and many others sustained this and wrote papers on it.

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Swent: It became very famous.

Lin: Professor Bertero at UC Berkeley, now emeritus, is a world-famous seismic engineer.

Swent: I was about to say, how did you learn all this about earthquakes? Were you consulting here with seismologists on the latest--

Lin: Well, not really. Because, when you design a building, you consult a seismologist. And in this case, I did not. This was some thirty years ago; I only knew the general design against earthquakes.

Swent: I was in Managua the year after that earthquake--

Lin: In '74. That's interesting!

Swent: Yes. I was there, and I saw the damage. Well, a few months after. It was terrible!

Lin: Do you happen to know if it has recovered now?

Swent: I understand it has. But at that time, the big hotel was unoccupied, vacant, but it stood. And, of course, the Bank of America building was there--

Lin: Now. Very interesting thing here. After that partial failure, the owner and the architect came back to us. What will we do now to repair these cracks, or repair the whole building? And after studying together with Professor Bertero, we figured out the building will stand another earthquake. But we will repair these cracked joints. Now there are two ways to repair it. One is to make it so stiff that the cracks will not occur. That, Professor Bertero and others advised us not to do because it may be so stiff that if an earthquake came the whole building will fall out, somewhat like the one in Alaska.

So we repaired it that it will crack, but the cracks will be controlled. And this is interesting. So we learn from those things. When I first designed that building, the architects wanted to put holes through my beams, every floor. And place these air ducts through my beams and leave big holes. That may weaken the beams and I said, "That's dangerous. Can you move the ducts elsewhere?" "No!" So we put the ducts through. And as I said, I strengthened these joints and designed for the second defense.

Now, after this happened, we discussed with the architects and our consultants. The architects say, "We could put the ducts outside. It goes underneath the beams." But our consultants advised us, "Let the holes be there so that it will again break without breaking the entire building." So we put the weak joints in. See, we completely reversed our positions. At first, I didn't want the holes. The architect wanted the holes. We put it there, and it cracked, didn't fail. Now, architect said, "We don't need those holes." But we engineers figure it's better to have the holes, make it weak. [laughs]

Swent: Make it weak in the sense that it's more flexible.

Lin: More flexible--

Swent: Doesn't crack?

Lin: It will crack but will not collapse.

Swent: It will not collapse.

Lin: Yes. Yes. That's very, very interesting. Very interesting.

Swent: So how did you repair the cracks then?

Lin: Essentially, all those cracks were redone. And I think we put more mesh in there. Wire mesh, so that the concrete, if it fail, will not completely broke, sort of held in place by the mesh. It is in a way a partial remedy, but everybody thought that's the best to do.

Swent: So you did go in and just repair the building?

Lin: Yes. Repair the building. Just at these particular joints. These joints were all around the central core. The building itself was okay. So we learned a lot. Even now, I think I have a pretty good idea to design against earthquakes. But I am no perfect engineer or architect. No one is. And I still don't know how the earthquakes are going to act, and how strong the earthquake is going to be. You can't tell. Same thing with the Bay Bridge here. We can do better, but not necessarily full earthquake-proof.

The Moffitt Library at UC Berkeley

Swent: No. Would you like to say anything about the Moffitt Library here on the campus?

Lin: Moffitt Library was designed by our firm. And that time, I took an important part in setting the whole thing up for earthquake design. But now, I cannot remember much, except that it was properly designed for earthquake at that time. Nowadays, standards have changed. I think it will pass the latest standards we have, even now. But I cannot remember the details. Do you have any details to ask me?

Swent: I have a little quotation here--this is from Joseph Esherick--

Lin: Oh! Yes! Yes! The architect--

Swent: Yes. And he said the building was not a very well-designed building seismically. And he's been working on the seismic reconstruction of it. I don't want to do a disservice to Joseph Esherick; I'm quoting from his--

Lin: Sure! Sure! That's okay.

Swent: --from his oral history. And let me read what he said.

Lin: Sure. Sure.

Swent: And this was just an informal interview too. He says, "Lin is a terrific engineer. Over the years I have known him well." He says, "T.Y.'s great contribution, I think, is to be able to conceive of the performance of buildings under stress in a kind of holistic way, instead of atomizing the structure and then analyzing each constituent part. He sees how the whole thing is going to go together. That's very important. Engineering is too often an analytical process and everything is pulled apart and then analyzed piece by piece. T.Y. is good enough to do that, but his understanding of the entire building is really great." Now, then, so he is obviously a great admirer of yours. He says, "Not many engineers have T.Y.'s imagination."

But then, when he's talking about the Moffitt building, he says, "The point is, that that building was not a very well designed building, seismically. It's a T.Y. Lin building." And then he says, "The fault was in the detailing. Not many engineers have T.Y.'s imagination, but backing him up has to be a very capable bunch of detailers. And I've been told that the detailing just isn't what it ought to be." Then he says, "And it was not on Moffitt. Moffitt is prestressed." So, anyway, he criticized the detailing on the building.

Lin: Yes. I think--should I answer?

Swent: Yes, please.

Lin: I think Joe is a very good architect. He probably knew something about engineering. He must have referred to some of his structural engineers who must have examined the details of this Moffitt building. What he said was essentially correct, but whether there were details that are not so good, I do not know. I don't know. He never told me, and no one ever told me. Now, when you design a building, when it's examined by another engineer, it's just like an architect design a building examined by another architect. 'I don't like this! I don't like that.' That is probably what he did. So, I don't know whom he engaged to study this who has different opinions. And he was right, you cannot guarantee every detail was correct. Because I never look into the details of everything. But, no building an engineer designs can stand the examination of another engineer. That's usually true. But how important these details are, I have no idea.

Swent: We won't know until there's a Richter 8 earthquake.

Lin: Yes. Even then it is very difficult, you see. It may not fail it, it may fail it. No building can stand a real big earthquake everywhere. No matter how you design it right, I think our art is not there and then of course, construction supervision is not all perfect. But overall, I believe Moffitt building is a very safe building. It may have minor errors here and there that I do not know of. No one has informed me. If Joe will tell me, I'll look into it and see where it is--

Swent: Well, it probably isn't quite fair to be quoting from him behind his back, but this was what he said.

Lin: I know, he essentially has good reasons. But there is nothing to be alarmed about. If you take Engineer A's building to be examined by Engineer B, they will always find something wrong.

Swent: Of course. What other buildings did you design or build on the campus?

Lin: Oh. We have several. Chemistry 2 building, I think, that is also by us. And then, let me think. There was a big garage building that was dismantled. I think Chemistry building 2 is another one. I think we designed all these buildings very much to the standard at that time. At least. I usually like to put in some more. Better than the standard. But whether I was able to do that or not, I don't know.

Swent: How did this work for your firm to be contracting with the university?

Lin: Oh, there's no problem. The university does that. The university engaged us. Whether the university engaged the architect, who in turn engaged us, the structural engineers, or the university directly signed a contract with us, I do not know. There is apparently no conflict of interest.

Swent: What about Wurster? Did you do that?

Lin: Wurster was a very good architect. I cannot remember if I've done anything with him. But I met him a lot and discussed with him a lot. Whether I've engineered buildings that he designed, I cannot remember. There might have been. Now, I and my firm have designed so many buildings, I cannot guarantee everything is--

Swent: Of course! Well, and as you said, you were consultant to fifty-three firms. That's a lot.

Lin: It's a lot. Yes. We worked, these firms were all pre-tensioning plants that produced prestressed or pre-tensioned concrete elements. That's a simple matter. Only, you have got to have the knowledge at that time, which I did. And after a few years, they didn't need me any more. And now I don't even have one such plant.

Conducting a Course on Technology and Modern Society

Swent: Your daughter Verna told me that you were asked to design a course, or work with others to design a course combining art and engineering.

Lin: Oh yes!

Swent: An indepartmental study in 1968. A course linking engineering and humanities.

Lin: Yes. There's a course, the university campus-wide course, entitled, "Technology and the Modern Society." So I was called on to teach that course. And what I did, I invited a dozen architects, engineers, et cetera to speak to my students. A big class, 200 or something. I remember I had Mayor [of San Francisco] Joseph Alioto among them. And he gave a very good talk. In fact, I published a two-inch volume, I don't know where they are now, of the lectures and so on, so forth. It's very interesting to try to teach the relation between technology and modern society. Which I was not qualified. But all those I invited were very good people throughout the country. I had to give lectures to these students, arrange the students to visit San Francisco and nearby places; it's quite an interesting experience for me. I learned as much as the students as they from me.

Swent: What did you learn?

Lin: Well, I learned about the relation between technology and society. We went to Hunter's Point and all these places with all kinds of projects going on at that time. So I learned a lot about society.

Swent: In what way?

Lin: Well, how technology can be applied to the society. And you must consider society as seriously as science. I think it's very important. I still wish someone can teach that course. As I said, I cannot. But the guests I invited were all very well-known ones.

Swent: Were the students mostly engineering students?

Lin: No! Not engineering. Very few engineering. It's a campus-wide course. The university decided to initiate such a course and then selected me to be the conductor of that course. So I taught it for one or two years; I cannot remember now. I think a course like that is very challenging. Among the engineers, I think I know a lot about society. But still, when I started that course, I knew very little.

Swent: I was thinking, when we were talking about failures, some of your "failed" bridges--I'm thinking in particular of the bridges, and we'll get into that later--they "failed" for political reasons and not engineering reasons.

Lin: You mean, they have not been built when you use the word "failed."

Swent: Right, yes. They didn't come to pass. And it was not structural, it was political.

Lin: Oh yes! Yes. I do not know of any structural failures of my bridges. But politically, they may not have been built.

Swent: I shouldn't have used the word failure; not succeeded.

Lin: Yes!

Swent: And the same, I'm sure is true with the buildings; you have political aspects as well, or social aspects.

Lin: Well, buildings less. Because architects are in charge, you see--

Swent: And that is a social function as well as an engineering function?

Lin: It is! When I design part of a building, I serve only as a structural engineer, I'm not the architect who planned the whole thing. So my contact with the client is not as intense as the architect in charge.

Swent: Yes. But you have to think of that social use.

Lin: I must say, I have not done too much along on that line. In bridges, I relate them, because I thought I am in charge. There is a long story to tell about the Peace Bridge.

Swent: We will certainly get into that a little later.

Lin: Where were we?

Swent: Buildings. Now we've talked about the one in Managua, which was a huge success.

Lin: In part, it is a failure. It cracked. [laughs]

Swent: What other buildings were you particularly fond of? There must be one or several that particularly pleased you--

Building Roofs; the National Racetrack at Caracas

Lin: Oh yes! Well, in the design of buildings, I think I should divide it into two parts. First, there is a long story about the building of roofs. The reason that prestressed concrete particularly applies to roofs is because roofs span a great distance. The longest I have designed go over a thousand feet. To get there, I started from shorter ones. So, we will first discuss roofs, then buildings, and then bridges.

Swent: All right.

Lin: I started with the first roof structures for the National Racetrack at Caracas, Venezuela.

Swent: Oh yes!

Lin: Did I mention that before?

Swent: No, but I have seen a picture of it.

Lin: Yes. This is when I just came back from Belgium. 1954. I was approached by architect Arthur Froelich. He was commissioned by the goverment of Caracas, Venezuela, to design the entire racetrack. To set some roofs over the grandstand, he envisioned a roof that cantilevers out ninety feet to cover the seats, sticks out, with no columns in front! And somehow, he visualized this can be built of curved thin concrete, only four inches thick. He went throughout all America asking engineers. They all told him no. This cannot be done. It just happened, at that time, I came back from Belgium. The first job I got, was offered through him, through Mr. Ed Rice, and to me. When I looked at the roofs, and I figure out we can do the building of prestressed concrete. Not four inches thick! But three inches! This really amazed him! He called me, I think through the Portland Cement Association, who says, "If anyone can do this, it's T.Y. Lin." So he got me, in 1954.

Swent: Which association was it?

Lin: Portland Cement Association. Association of all the cement producers.

Swent: Your firm was a member of the Portland Cement Association?

Lin: No. Not at all. We're a seperate consulting firm under my name, T.Y. Lin Associates, set up in Los Angeles, under the management of Mr. Edward Rice.

Swent: Were you a member of any association?

Lin: Yes, of several structural engineering associations, civil engineering associations. But the Portland Cement Association belongs to the producers. They have much more money, you know. They knew of my very limited work. But they knew me personally--

Swent: How did you meet them?

Lin: Well, through papers and writings, I think, that's why they knew me. And later of course, I arranged the trip to Russia with their help. And I believe they even subsidized our committee on the world conference, with $20,000 or whatever, to promote concrete. So anyway, when I told them three inches, they seemed to believe in me. And I had never done a job like that before. I did design some prestressed concrete buildings in San Francisco, and bridges, small ones in California, but not a roof sticking out ninety feet with 3-inch thickness. And I had this vision. Throughout the world, at that time, the most well known was by Professor Torroja of Spain. He was a very well-known engineer. He had designed roofs sticking out some sixty feet, with something like 12-inch thickness. But that was reinforced concrete. Not prestressed. But I, having studied that thoroughly, knowing the basics of prestressed concrete, I knew this can be done with three inches. It's a very beautiful thing as you see from the picture.

So I had this job, and he said, "Okay. Good!" Some people can trust another person. For whatever reason, I don't know. In this case, it happened to be right. So I designed this myself, with the help mostly of my students working in my office. This includes Felix Kulka, Howard May, and others. So I got this all designed to be built in Caracas.

Swent: Did you go to Caracas?

Lin: Not at that time. Later, I returned from Russia, 1958, the roof was just finished. We went from Russia to Venezuela. I remember, departing from the Russian airport, our host, Professor Skramtaev, looked at my itinerary and said, "You and Mrs. Lin have such a long travel! From Moscow to Caracas, Venezuela! South America!" Of course at that time, Russians wouldn't have the opportunity to do that.

So anyway, we got there, and then we went to top of this roof, to the tip of this roof, ninety feet out there, with several of their people in charge, and jumped at the tip. [Extends arms to demonstrate; holds one arm out, supported by the other arm.] I could feel the whole roof move. People were scared. I said, "No! It's alive! It has to move. I knew it would move. It moves in inches, or fractions of an inch. But you feel it." We compute this all the time; we know it's going to. You know how I designed it? I designed this whole roof so that it will act as a horizontal column. [Extends arms again.] I put force, put cables from the tip to the back; they're tied over in the right way, so that I control the whole force. All the gravity force pulling down is balanced by my prestressing force going up. So as a result, the whole roof does not feel like a roof. It acts like a column! Force goes horizontally, column, horizontally along the roof! So it doesn't move! See! Doesn't move up or down. It does not deflect up or down, but it does move.

This is where understanding is most important. This project is a success up to now. We went back twice again. Not one crack could we find there. Because when I designed a roof like that in reinforced concrete, the tip of this roof may go down perhaps a foot. But this one in prestressed concrete would go up two inches. Up two inches! In the course of time, when concrete shrinks, this will go down, to almost flat. I believe the roof now is flat. If it ever comes down, maybe at most another inch, which is nothing. That's why the roof is so safe! Usually, under gravity, the force goes vertically, but here the force goes horizontally. Never a roof has been designed like that.

But by prestressing, I did the trick. And that's written all over. All in technical papers. No one else dared to do it. When I did this, people look at it, I know, everyone think, "T.Y., you have no fear!" I don't understand it. And I think this is very successfully carried out. It's prestressed in the horizontal direction with cables, tightened back into the back, changing the horizontal roof into a column. Even now, forty years later, after completion, no one has done anything like that. The thing is still there.

I did not have the opportunity to do this same thing again, but similar things I have done anyway. People cannot understand it. If you understand it, you can do it. Now, how to carry out such a structure in the field, how to supervise construction--we were using local people, who have very little knowledge of good construction. So we dispatched our engineer, Howard May, who had his master's degree at Berkeley also.

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Swent: Howard May was supervising the construction of this racetrack in Caracas.

Lin: Now, this big race track, National Racetrack, with its unusual roof, was constructed under the order of the king, or president, I cannot remember.

Swent: Probably president.

Lin: President of Venezuela. He went there every weekend to see it. And ordered, "This must be finished before New Year," when he will have re-election. So Howard May rushed. And the contractors rushed. And one day, Howard May went to the field; he was there all the time anyway, and looked at the falsework, the support for this roof. This roof was built by supports from below. They're maybe a hundred feet high, I don't know. Fifty, a hundred feet high, all timber trestle in the old-fashioned manner. And one day, he observed, the supports were buckled! Almost falling! He quickly called them up and strengthened it. That saved the whole thing. Now, if he did not see that, this roof could have collapsed under construction. And I would be in deep trouble. Although I had nothing to do with the construction. Construction was the contractor's responsibility; my responsibility was the ability of the roof to stand after completions. During construction, it's theirs. But if it collapsed, then it's T.Y. Lin's fault, particularly if he's doing something new. [laughs]

Swent: Of course. And these were timber supports?

Lin: Timber supports. They were very poorly braced, you know? Poorly braced. I don't know how he observed the thing to buckle. Because they repaired it. And the roof was finished the next year, whatever it was, 1957 or something. Then there was a re-election and the president was deposed. [laughs] I can't remember his name. It's very interesting. But the whole thing was finished.

In 1958, we came back from Russia we saw it; Margaret and I went back at least once or twice more, to be on the tip of the roof to jump there. We always had great pleasure calling the local people, "Go ahead and jump." And we noticed then, they have put additional weight on the tip of the roof, a whole setup of T.V. cameras, including the housing. At the tip of the roof! My "guesstimate" was that the roof could have come even further down maybe by one or two inches. But that wouldn't matter. It could deflect about a foot or two without collapsing.

This is what you have to do in engineering. I design so it will take almost anything I can think of, but sometimes I can be wrong. But so far, I have not been, because I provided extra strength and movement. Sometimes it's not necessary, but it's there, due to prestressing, which can control it. Since I had that ability to control, I might as well put in a few more cables and control it. This is why my design is all so safe. Now as to earthquake, that is another problem. I don't know how strong an earthquake may be. It may even fail one of my buildings one day.

Swent: It's a question of putting in more cables?

Lin: Well, more and where and how.

Swent: More and where and how.

Lin: And how. Now, one problem in prestressed concrete is: more can be very bad. For example, a bridge tends to bend downward, so you put cables to hold it up. Generally, when you build in reinforced concrete, you put in more 're-bars' as we call them. In prestresed concrete, engineers put in more cables and tighten these cables so the whole bridge bends up. And there are some bridges here on Highway 80 somewhere, they bent upward for several years before coming down. Sometimes they prestressed it so much that it bends up first. I try to obtain the optimum: that is, flat. Sometimes I may not be able to do it. But if I aim at flat, it will not be up or down that much. That's why I can do all these things, with great safety and very little money. You put the cables right, tighten them right, it should be right if you know how to do it.

You have to understand the theory. You have to know how to use it. You have to build it right. So this one, as I said, fortunately Howard May was there to save that collapse. But he didn't save the president from being ousted. [laughter]

Swent: Couldn't help that.

Lin: Couldn't help that. Yes. Now, they put additional things on the tip. Without my permission. It was never designed for that, but the whole roof was designed for a lot of wind forces up and down. This additional weight doesn't belong there. But you see, it will not collapse; if it is going to collapse, the first thing you'll see is it bending down. Then you'll see cracks before it fails and collapse. So it never will collapse and kill people. It shouldn't do that.

Swent: There would be warning?

Lin: Yes. There should be warnings. So far, there are no warnings. Thank God! [laughs] I think this roof was the first and, in a way, a greatest achievment of engineering I have done. Now, no one has beaten that record in cantilever and thickness. No. So there's great satisfaction. But many other problems concerning engineering common sense in designing this building which was actually under the charge of an engineer Henry Layne. He's a very good structural engineer in Los Angeles. He worked with me on the details and that helped a lot. You talk about Moffitt Library, I don't know the details. Maybe there were some not so good details, but I don't think they are serious.

Several Coliseums in Different States

Lin: But anyway, having made a roof like that stand out, my ability to design new roofs became very well known and I designed several in this country. They are all still there, quite outstanding. One of them is the New Jersey Garden State Center, which is still there in New Jersey. A roof supported of eight columns, two hundred and sixty foot round. Prestressed concrete and precast. Later on, not like the Caracas roof, which is built on supports, which was costly, although the president didn't mind. In New Jersey, the roof was more economical since I designed it using precast pieces, then put all together, and post-tensioned together.

Then, another roof, in Oklahoma. Oklahoma City needed a 400-foot-round coliseum, seating maybe 20,000 people. So the architect came to me. I designed it entirely of prestressed concrete. Also unusual, using what we call a horse-saddle shape, which is technically known as an HP shell, hyperbolic parabolic shell. That's very nice. The shape just fit the seating using a saddle shape. Four hundred feet in diameter supported on the circumference. Of course no columns inside. For that, I also used precast concrete to make it more economical.

Then after this was done, Phoenix, Arizona, also wanted a coliseum, 400 by 320 feet in an elliptical shape. And no one had ever designed anything like that. But I figured out with post-tensioned concrete I could control the forces. I knew what was going to happen. So both of these roofs were built about in the 1960s, some forty years now.

Swent: When you precast something like that, how do you do it?

Lin: In pieces. Each piece on the order of ten feet square, so you can lift it up and put it on. I put the cables on first, and then the pieces. The precast pieces were lifted from the side and put on top of the cables and these were all carefully arranged.

Swent: And then how are they tied together?

Lin: By tightening the cables. After they put the pieces on, the cables were tightened together. So that's a trick of course. But that's how it's done.

Swent: I'm envisioning the cables, and you just lay pieces of concrete on top?

Lin: Yes. Yes. There were two ways. One way, I slightly support the cables on stilts to keep them in place. And then put these pieces on, and then I tighten the cables and remove the supports. But that's not like at Caracas. At Caracas, the whole fresh concrete is supported below. Here, the cables were laced across the whole space into a round or elliptical ring on the outside. See, all these have pictures. I think the slides showed them. If not, I can supply some more. Every roof is a unique design and no one has been able to imitate it. Although some good engineers can do their own better, but I don't think there are any copies.

This is unfortunate. We engineers were not trained to create new thinking and new forms. Architects are. But they will not know how to do it. They have the idea, but they don't know how to do it. Engineers can do it, but they don't have any imagination.

Swent: I think that everyone seems to agree that's one of your special qualities, that you had both the creativity and the engineering.

Lin: Yes, yes. But in my creativity, I consult architects a lot. A very good architect who consulted with me was Myron Goldsmith. He was a partner of Skidmore, Owings, and Merrill. You've heard of the name?

Swent: Oh, yes.

Lin: And he worked with me on several of these roofs, giving me ideas. But the initial concept was usually by the architect in charge. The architect conceived a form and then consulted me, "Can you do this?"

I generally say, "Yes. I will do it." Then I get it done. There was a Highway Inn in Arizona, which is much smaller, 200 feet in diameter. Yes, also prestressed. A theater 200 feet in diameter. A small one. Also very beautiful. But the beauty of those things I must give credit to the architect. I did not dream of the shape. But I can make it, I can realize it. And realize it economically! You see. Now, these roofs, there are so many of them, that our firm had been living on them for a few years. Everybody was building coliseums and things of the sort.

A Unique Roof in Puerto Rico

Lin: The latest one was one in Puerto Rico. Very interesting, where the whole roof, about 300 feet square, was supported on four columns. And the shape is unique. Here the architect consulted with us at the beginning. He wanted to build a theater seating some 15,000 people or whatever, and cannot afford air conditioning. In Puerto Rico! In the city of Ponce. So we together envisioned a design. Four columns, and the roof stick out so that air will flow from one corner and out the other. See, it's open. Open to the air. Very hot air, that no air conditioning required. This was built, and is still over there now. The shape is unique. Each corner sticks out 140 feet. And here I used a 4-inch shell. The roof is curved; that's why it has strength. The strength depends on the curve and on the cables. I put the cables in the right manner and tighten them.

Swent: And was this precast as well?

Lin: This one in Ponce was all cast in place. The one in Pheonix, Arizona, and Oklahoma City were precast, each one to meet the conditions there.

Swent: Does this mean when it's not precast that people were up there pouring the concrete--

Lin: Yes. So, we set up the forms with timber support, and put the form, and pour in the concrete. Yes. Yes. It's the same with Caracas, in place. Same with Ponce, in place. That's a tough job. But we did that all the time.

Swent: I'm thinking labor is much cheaper there?

Lin: You're right.

Swent: Is that what makes part of the difference?

Lin: I think so. Yes. Yes. But precast can be done here and there. Yes. There's a lot of stories about those things that are very interesting. I think it was the Phoenix Coliseum about 400 feet in diameter. While it was under construction, it had a ring on the outside. And I was giving a talk at the University of Illinois-Urbana, on my designs. Just after my talk, one person came in, said, "Hey, Professor Lin, you have an urgent call! At the job site, in Phoenix, they have a problem." Okay, so I call up the local foreman and engineer. What happened is, this big ring, 400 feet in diameter, they built it off from the surveyed lines, off by some five inches. Now, if they would dismantle half of the ring to get a better fit, it would delay two months. I said, no, never mind, the five inches made no difference. Just pour it on. Because I knew the theory, you see, so I can say that. So they just poured it on, without any delay, and the roof was finished, still there now. This is the kind of courage people do not have. I can tell this is important or that is not important. And I'll give the order to do that. It's my responsibility, my design and I'm not afraid of it. I knew five inches here was nothing. Because I have cables in there already which permit such errors, but I'm not going to tell them first so they can make mistakes; then I could get trouble all over. [laughs] But if it did happen, then I will size up the situation. This is why I cannot remember of any important mishaps I've had. This is only five inches on a ring beam twelve feet wide, so I told them to go ahead!

The Moscone Center, San Francisco

Lin: Of course the Moscone Center is a very interesting project. So we'll talk about the Moscone Center now, which is a long story in itself. Well, we'll have time; it's eleven thirty. Maybe we'll finish Moscone and then go. How long do you have?

Swent: I'm fine. I have plenty of time.

Lin: Yes. We have to finish before twelve anyway. All right, I will tell you about Moscone now. Moscone Center had a good architect firm called HOK, you may know of. And Obata was in charge. A Japanese, American-born architect, he's very good. So he was commissioned by the city to do the job, the entire layout. And we were chosen to be structural engineers also for the whole job. I think I was chosen because I had some relation with the owners, having met Diane Feinstein a few times. So she suggested me to her city manager, Roger Boas. You know Roger Boas?

Swent: I know the name.

Lin: Yes. Anyway, we got the job through Dianne Feinstein and Roger Boas who also happened to know me. They decided to give me the job because I've done so many others. Now in working with Obata, how to design this whole building with the main construction being the exhibit hall, which should be 300 feet wide, by 800 feet long, underground hall with no columns. So we worked up many, many designs. Finally, we arrived at arches. Arches. So we put on a series of eight pairs of arches, so sixteen arches in the Moscone Center, against other steel trusses, steel arches above the roof and so forth. No! The rooftop must be flat. And the rooftop must carry three feet of dirt and trees, which the people demanded of the city. "You build this center here; we want green space." So we would leave the whole top, 300 feet by 800 feet, flat! To receive three feet of dirt. Now, they did not put the three feet of dirt but put on three stories of buildings on top of my arch. I did not do that. Then they studied my design which can do that because it was ready to take the dirt. So instead of the dirt we put three-story buildings. They are still there; nothing happened.

Now, the whole case is very interesting: to look good and to be safe and to be economical, they should be concrete arch. Steel may not look that good and may not take that much loading with three feet of dirt. So finally we decided on concrete arches. But one big trouble with concrete arches, when you put the three feet of dirt on those arches, the arch will come down, ever so slightly. But it will keep coming down, due to what we call the creep in concrete. So to prevent that, I designed these arches in a very special manner.

I anchored at the ends of the arches, cables, 300 feet long, to be tightened against the arches and to push them upward at the crown by four inches. Three or four inches, I can't remember. In order that eventually when you put on the dirt, it will come down and become flat. You see, this is my way of thinking. If I didn't do anything, each arch will come down four inches. Now if I push it up four inches, eventually it will come down flat. But how can you push a concrete arch, eight feet thick, or more? So Dianne Feinstein told me, "T.Y., are you sure you can do that?" "Of course." So we'd see. So they were ready to build these arches and to pull the cables. Each so-called cable is made up of fifteen smaller cables and each small cable is made up of twenty-four strands. Each strand is made of seven wires. So, there were enormous number of wires down below, which nobody can see. What did I do? I had them go in and pull these until the arch goes up four inches. Now, you could hear the arches cracking [makes cracking noise]. People would be afraid of that. I did explain that by drawing and had used computer programs to prove it. But the concept came from me. And the assurance came from me. The crown will go up four inches, which every arch did.

So one day when construction started, we held a public hearing at the Center in that big convention hall. And in came several newspaper reporters. I was at the podium. "Professor Lin, what do you think will happen to this building during an earthquake?"

I answered, "I would advise the people of San Francisco to come down here and get protection." You know! This actually happened. During the Loma Prieta Earthquake, 1989, after the quake, the building stayed intact of course, several thousand people went down to get protection. Whether it is due to my declaration or not I don't know. They just felt very safe and nothing happened.

##

Lin: Now let me tell you why I think it's safe. This whole Moscone Center has a concrete slab down below, six foot thick, to counteract the water pressure that's pushing up, you see, because it's underneath the ground. There's water pressure pushing up. And the slab was laced with thousands of wires to push it together. And it held these arches, and the arches have been pre-cambered. Never done before. But it has this additional safety. And on top, they're all precast, prestressed and everything. All the calculations were all done by my engineers and so on so forth, but I knew I had a high factor of safety in the building, so I invited people to come down and get protection.

Now, one thing I did not expect: during the construction of these arches, I think it was by Turner Company, a very big company. The last pair of arches, they were in a rush to finish on time. Now the arches were concreted on falsework. Only after we tightened these arches up, can the falsework be removed. One day, they were rushing the work, they lowered the falsework before they tightened the cables! You see, the arch kicked out at the ends. And the cables held them in. But the foreman didn't know that. They lowered the false work something like seven inches. And our engineer across the street heard a big bang, and the whole arch came down seven inches. Fortunately, it was then supported by the falsework. Fortunately, I was in Europe somwhere. [laughs] I was out of the country. Next day they quickly went in, and tightened the cables, and lifted the arch seven inches back into its position and up another four inches. So it's absolutely safe there now. But can you imagine a very strong arch being moved up eleven inches at the crown! I did not design them for that. And then if it collapsed, I will be in trouble. But God saved me from a possible failure. That's really something.

Now, after this was all in place, I gave them the reasoning, why this arch can come down seven inches and still not crack. You see, I designed the arch to be moved four inches up. So by reasoning of symmetry, it can probably come down four inches. But we usually had a factor of safety of two. So it can come another three inches. That's a good way to reason it after God helped you. [laughs] Now if this had collapsed, Turner would be in trouble, and I would be in trouble. Fortunately, God always takes care of these constructions somehow. In this case, they were designed to go up four inches, but eventually came down a total of eleven inches. It's not impossible. I had not designed for that, but it did take care of itself. In this case, the cable ends were attached but not tightened; they were pushed to the end and the cables held. [long sigh] Aaah! That's how it is.

Swent: So good design saved the day?

Lin: But the design was beyond my real design, although generally I provided additonal safety. Sometimes it may not work; it did work here. God knows.

Swent: Well, you designed for a lot of safety.

Lin: Always! Yes! Now my point is, how can we pass on such ideas to the younger people? It is difficult. It is difficult.

Swent: Teaching?

Lin: Teaching. But when I taught, I didn't have any of these. Or sometimes I put a little of these into the class, that helped but not too much. Okay, so I finished about Moscone Center.

Swent: That's very interesting. There was a lot of criticism of this center when it opened, I remember, about the roof not being high enough.

Lin: Yes. You see, one is, if it get higher, you have two limits. Down below you cannot go too deep. And up above, you're not to go above a certain level. So, for whatever reason, they fixed that level. I don't know who fixed that level but we stuck to that. But whether it's not high enough, I don't know. It was twenty-seven feet high from the inside. If you put it higher, you would go up more. Many people will not allow it. These details are worked out by the architect. I did not have much to say at that time. I took the limits and then designed the things to fit it.

Swent: Have you been in it recently?

Lin: All the time. Yes. Yes. It could have been even better, I think, but--

Swent: It has certainly sparked a revival of that part of the city.

Lin: Yes. I generally, as I said, did not take part in the social and other performance of buildings because the architect was more in charge. I furnished the technology. And now I begin to play some part to help them create their imagination.

The Enormous Roof in Kuala Lumpur and Insignificant Cracks

Lin: The final roof I will talk about is the largest one. A thousand feet in diameter outside of Kuala Lumpur. The king, Shah Alam, wanted to build a big coliseum seating 85,000 people with cover on top but the center of the roof would be open to air because they want us to do that. This puts the athletes under the weather but the onlookers under cover. They hired a French architect, together with a local Malaysian architect, to design this building, this whole thing. And our firm in Singapore was appointed as structural engineer.

Swent: This is T.Y. Lin--

Lin: T.Y. Lin Singapore. In charge is Mr. H.S. Teh. He's very good. I served as their consultant and whenever I go to Singapore, they pay me and Margaret first class and treat us first class hotels and food and everything. But I don't take no salary. Don't take no pay. I don't need that money. So we enjoy ourselves. Anyway, on this one, I was the consultant. Very interesting. Going through all kinds of things. Finally, just finished about four years ago now. Now, when you have a roof a thousand feet like a moon, it really looks like two half moons with the center open. Prestressed concrete became too heavy. So we used a steel design for the roof. But, the outside circumference, a thousand feet in diameter, the architect insisted to be built of concrete. And this was prestressed concrete. The concrete ring is fifty feet wide and goes 1,000 feet in diameter, and it's steel on top--

Swent: I don't understand, fifty feet wide--?

Lin: Yes. You see, take fifty feet wide, a ribbon, goes a thousand feet in diameter. This ring is a thousand feet in diameter, and fifty feet wide. The two half-moon roofs are of steel. The ring is of concrete, fifty feet wide, and goes all around.

Swent: You could say thick, like a wall?

Lin: The rings are fifty feet thick horizontally.

Swent: All right. A wall that's fifty feet thick?

Lin: Horizontally. Horizontally.

Swent: Oh! My goodness. And you have to have entrances and exits?

Lin: This roof is over the top, entrance from below.

Swent: And it's supported by this fifty-foot wide--

Lin: Yes. Which in turn is supported by columns or whatever. It's a very strong, beautiful thing. It's finished. In Kuala Lumpur.

Swent: So the ring itself is prestressed concrete.

Lin: Yes.

Swent: And the roof is steel.

Lin: Yes. So one day, while I was in Singapore, I got a sudden call from Kuala Lumpur. The concrete ring had a crack!

Swent: Oh, my!

Lin: So I went over to take a look. It was some cracks which were not important. Which will heal and close after completion. During the course of construction, that's going to happen. They didn't know that, so they called me. I went to the field and took a look and said, "Okay. Never mind." So that's all okay now. Eventually it will heal itself. That's a kind of observation and decision I can make and no one else could.

Swent: How does a concrete crack heal itself? I don't understand.

Lin: Well, you see. Okay. Because of two things. First, completion of prestressing could tighten them up. Secondly, during the process of construction it may have cracks. In this case, it's because the other part was not yet built so it cracked. It's just a temporary local crack. But you have to make the decision.

Swent: But when you get the full tension on it, it is not important--

Lin: Yes. When you get the full tension on the cables, putting full compression in the concrete, and the cracks are closed or healed, it was okay. That's enough for today!

Swent: It's all in knowing which cracks to worry about?

Lin: Yes. Many of these cracks did happen. And people called me to find solutions. Most of them will come out okay. We'll talk more about cracks on bridges later on, okay?

Swent: I worry about cracks too because I don't understand. Have you been down in the new library?

Lin: Not recently.

Swent: There are circular stairs that go down--

Lin: Oh, they're bound to crack.

Swent: Every stair, every step is cracked.

Lin: Then I should study it. They must have buried steel in there to take care of it. That's what we called reinforced concrete, whose steel acts only when the concrete cracks.

Swent: I hope so.

Lin: If it's proper steel, it's no problem. If not--

Swent: But it's a brand new building--

Lin: Which one?

Swent: I'm speaking of the underground connector between Moffitt and Doe.

Lin: Oh. I have not seen that. New buildings, inside is steel. If no steel, then you're in trouble. Concrete, no good. Steel inside, yes.

Swent: So a few cracks in the concrete really don't matter?

Lin: No. No. Look at this building, our home. These cracks. You see them? There are some.

Swent: Oh, yes, I do see them.

Lin: Because I prestressed it this way, not prestressed the other way, so it cracked.

Swent: But the crack doesn't matter?

Lin: Doesn't matter.

Swent: I'm glad to know that. I also wanted to ask you about your ballroom in your house. You spoke about your house but you haven't talked about the ballroom.

Lin: All right. Next time we will talk about the ballroom first and then the bridges.

Buckminster Fuller as a Guest Lecturer

[Interview 7: September 7, 1999] ##

Swent: We were just looking at the *Engineering News Record* here--it's a McGraw-Hill publication, a publication of the construction business, a special issue for the 125th anniversary--and they listed the 125 top people in engineering in all those years. You are one of the very few listed as structural engineers, and one of them is your forerunner Freyssinet, and then Buckminster Fuller. You were telling about inviting him to address your class when you taught the arts and engineering course--

Lin: That was back in 1960 some, when I was a campuswide professor of Arts and Sciences at Berkeley. So I was given the task of organizing a class, talking about technology and society. So he was one among several I invited to my class. He came, and talked. Supposed to be a one-hour speech; he passed one hour, way into the second, at least fifteen minutes or more. But there was another class waiting outside the room. So I unfortunately did not know that it was his practice to talk longer and longer, no end. I thought an hour is up, it's an hour.

But he went on; finally I had to tell him to stop, and people told me that's very wrong of me, because I should have known that when he says one hour, he means two hours. [laughs] And he talked in languages and used terms which I didn't quite understand. He's a very learned man. Somewhat like Frank Lloyd Wright.

Swent: How did the students react to this?

Lin: I think, in general is okay. Because he's interesting. He used high words, high-sounding words and all kinds of terms. But frankly, I did not quite understand him. That's my problem, being an engineer, but he's the inventor of the hemispheric dome.

Swent: Geodesic dome?

Lin: Geodesic dome. Actually, he's not an engineer, but he's a philospher.

Swent: Did he talk about his dome?

Lin: I think he did. But more philosophical. Actually, as I admitted, I did not remember all of his talks. He's above me.

Swent: Above you? Oh, my!

Lin: [laughs] But then, we're into this special course. The same course where I invited other people, very prominent ones. Did I tell you about the story of Alioto, Mayor Alioto, Joseph Alioto in my class?

Swent: Yes. And he decided not to run for governor as a result of speaking to your class.

Lin: Yes. Yes. So I told you that story. That's another one. That's another interesting one. Who else? I told you about meeting Frank Lloyd Wright the other day?

Meeting Frank Lloyd Wright

Swent: No, you have not mentioned Frank Lloyd Wright.

Lin: Ah! All right, let's do that.

Swent: Let's talk about him.

Lin: Frank Lloyd Wright is also among the 125 ENR [*Engineering News Record*] list. He was quite a person. Now this is way back, in 1949 or something. When I first joined the university, only for three or four years. He came to the Bay Area to talk about his butterfly bridge. If you remember? They proposed a bridge across the bay. With wings! See? And having a high point in the middle of the bay, spreading into two wings that people can stop there and look at the bay. He called it the butterfly bridge. Very well known.

And the question wasn't asked until later, "Professor Lin, do you think this bridge can be built?" You know, when he advocated it, I don't think the profession, construction or engineering, has the ability to really build it at that time.

But, this was about 1980 some, the question was revived, and people asked me again. And I figured out the bridge can be built! In fact, without too much additional cost using modern technology. You see, that's the kind of thing people can do now. But when the time he advocated this bridge, I think there was a radio station, I don't know if it was T.V., maybe it was, or not, 1949 or thereabouts.

So a radio station asked our university, "We would like you to send a faculty member, engineering, to appear with Frank Lloyd Wright on his program. Special program for him." The university asked several professors; no one would come. They know he's difficult to deal with. Finally my professor, Jameyson, asked me, he was chairman of my department, "Professor Lin, can you appear?" "Oh yes!" I didn't know who he was! So I appeared. At the interview, the moderator asked me the first question. He said, "Professor Lin, why is it that your faculty members refused to appear with Frank Lloyd Wright?" Off the top, I said, "We engineers will appear with anyone and talk with anyone, including politicians; why not Mr. Wright?" I did not know he hated politicans, and just off the top said it.

And from then on, the interviewer talked to me for ten minutes before he went back to Frank Lloyd Wright. So Frank Lloyd Wright was not too happy. I didn't know who Frank Lloyd Wright was. I didn't know he was a famous architect. I didn't know he has a prejudice against politicians. I used all the right words--all the wrong words! [laughs] So that's the first time I met him.

Swent: Did you ever become friendly?

Lin: No. I don't think he remembered me, but maybe he did. The next time, after about six or seven years, whatever, after the Richmond-San Rafael bridge was built, he came again to visit Berkeley. And the Department of Architecture invited him to a roundtable discussion. They were all architects there. I was there because I met him before. And in came Frank Lloyd Wright, "Is there anyone here who's not an architect?" That's typical of him. And so I raised my hand. "There shouldn't be anyone here but architects!" That's typical of his way of talking. I didn't care; I was too young.

The Richmond-San Rafael Bridge: Misjudgment to Save Money

Lin: Then he went on and on and finally he was asked a question, "Mr. Wright, what do you think of the Richmond-San Rafael Bridge?" Which wobbles up and down, which is not supposed to be aesthetically correct. This is an engineer's bridge and invites much criticism from the Bay Area people, particularly architects.

Swent: Did you say it wobbles?

Lin: Oh. It goes up and down.

So, one architect asked him, "What do you think of the Richmond-San Rafael Bridge?

"I think it should be sabotaged!" He meant that it should be bombed, it's so ugly looking.

Swent: Oh, my!

Lin: This is typical of the kind of way he talks. So I just didn't pay him any attention. But later on, I went into the matter and asked the engineer, a reasonably good engineer but without aesthetic feelings, why the bridge was designed this way. He said, "To save money. Because the bridge goes up here to allow a ship to go by, and down with shorter piers, and up again to allow another channel for the ship to go by."

So I asked how much he saved. "About $200,000," he said. That was some money then. But that sum is not worth the poor look of it. People look from far, the Richmond-San Rafael Bridge, it goes hump, down, and another hump. According to Frank Lloyd Wright and other architects, it should be smooth. Oh, I remember the name of the engineer, Norman Raab. He was one of the older engineers who had no idea about aesthetics. He designed that bridge.

Swent: How did you feel about it?

Lin: Now, I was only beginning, also had no idea about aesthetics. I didn't think it was so bad. But after things were pointed out to me, I thought just a misjudgement on the part of the engineer to save $200,000. Even at that time, it didn't look very good. But later, that led me to another story. I had an argument with this old engineer, my senior. Norman Raab was in charge of all the bay bridges. Later it came time to build the San Mateo Bridge. He proposed the San Mateo Bridge to be double deck, one on top, one on bottom, like the Richmond-San Rafael Bridge. He proposed steel trusses.

Allan Temko and the Design of the San Mateo Bridge

Swent: The Richmond-San Rafael Bridge: is that double deck?

Lin: Double deck. The Richmond-San Rafael Bridge, one deck on top, one deck below. Save money according to him. Probably did save some money. Now come to the San Mateo Bridge, he wants to design it just like the Richmond-San Rafael Bridge which he is used to. And then, I think, lots of people objected to the look of this type of bridge. Double deck and steel truss. Allan Temko wrote an article against this. And that caught public attention.

And in his article, he quoted T.Y. Lin. He had consulted me and whatever I said and--then we hit the headlines, so that Governor Brown called a meeting, a public hearing on the bridge design. And came in steel executives, board chairman or president of American Steel Company, et cetera; we all met in a big hall--I cannot remember where in San Francisco. At that meeting the steel people were so powerful, you know! [laughs] They declared it must be a steel bridge. It must be a girder bridge as hinted in Allan Temko's article and then was adopted with the approval of the steel board chairman. I was too young to say anything. I was there but I didn't say anything.

However, I was, a few weeks before that meeting, quoted by Allan Temko as being against this repetition of the Richmond-San Rafael Bridge. And that made me a nonconformist. And also, there was an engineering uproar against me that I shouldn't be speaking something against another engineer. This kind of thing. But Allan Temko was for the critique and he changed it to a girder design. Hence the San Mateo Bridge was designed of the girder type. Among the longest girders in the world. Steel girder, with a main span of 750 feet. It's beautiful, single deck. Much better than Richmond-San Rafael Bridge.

Swent: I need to clarify this: Governor Brown called this meeting, and the steel people carried the day, so the bridge was--

Lin: Decided to be steel and to be a girder. Instead of truss going up and down. And that was initiated by Allan Temko but consummated by the steel people. I was saying something like, "It could have been a concrete bridge." And that was lost somewhere. But the steel people were so powerful. "Could have built a prestressed concrete bridge." I probably said something like that. "Doesn't have to be truss." And that was quoted in the papers and I riled a lot of engineers, conventional engineers against T.Y. Lin as well as Allan Temko. Anyway, the bridge was built--

Swent: It's a beautiful bridge--

Lin: Beautiful bridge. You know who designed the bridge? Allan Temko did! He initiated the whole thing. Without him, this would have been another one like the Richmond-San Rafael, steel truss, double deck. He insisted on a single deck and a girder bridge.

Swent: Wouldn't it have been the same for the steel people if it was girder or truss? Would they care?

Lin: That is correct. They wouldn't care. But the steel truss looks so ugly. So in a way, I think, the steel won, they got a steel bridge, and Allan Temko won, got his ideas put on there. I sort of helped part way. Then Norman Raab was so mad! The one who designed the Richmond-San Rafael Bridge. His wife called up Margaret.

Swent: Oh, dear!

Lin: She said, "Why did your husband do a thing like that?" Engineering has a, sort of a fraternity. Not supposed to say bad things about the other. Although many people do anyway. My intention was not to say anything bad against Norman Raab, whom I know. But I have to say the truth. To this day, I still have this problem and it hurt some people. In general, by and large, I have to say what I believe. So this is a side story.

Swent: Well, that's very interesting. So you felt that in the end the bridge was both beautiful and well engineered?

Lin: Yes. Yes. It's a very famous and good-looking bridge if compared to the Richmond-San Rafael Bridge. Who initiated this! Allan Temko! [laughs] He figured he got the idea from me; actually, it's not entirely true. He did call me any way--

Swent: But he grabbed your idea--

Lin: He wanted to get an engineer's support, you see. Allan Temko's a good friend of mine anyway.

Swent: Yes, he is. That San Mateo Bridge has won a lot of awards. Didn't it win some national awards?

Lin: Oh, yes. It's a beauty.

Swent: And now they're making it wider.

Lin: You see, the main bridge, 750 feet steel girder. They are not making it wider. It was designed for six lanes. The approaches now only four lanes, so they're going to widen the approaches.

Swent: I see. Not the bridge itself?

Lin: Not the main span itself. The approaches will be widened. They had foresight. You design a building, might as well build a big one, so they put six lanes, whereas the approach was two lanes, which can be widened later. This kind of foresight, by the decision maker, whether engineer, architect, or planner, sometimes can be all wrong, sometimes can be all right. But anyway, that's the story.

Much of it is in the [San Francisco] *Chronicle*. You can dig up the article by Allan Temko, which led to this San Mateo Bridge. So when I see Allan Temko, I'd say "You designed that bridge, part of the idea came from me! [laughs] Very interesting.

Swent: Last time we talked a lot about buildings and roofs.

Lin: We will now talk about bridges in general, and finally the Pudong Bridge.

Swent: Bridges in general. Very good.

Twelve Cover Stories in the *Engineering News Record*

Lin: But just before I do that, I'll show you another little thing. In *Engineering News Record*, every week they have one issue, and they have a front cover. I have here a list of twelve cover pages on me and my projects. You can keep this.

Swent: Oh, this is wonderful! Starting in 1961 to 1983, twenty-one years of cover page stories.

Lin: Twelve stories on T.Y. Lin and his designs. No one else has that record. At that time, I found out, another big firm, had about four projects in the front pages. And I had twelve.

Swent: And a tremendous variety, too.

Lin: Yes!

Swent: A parking structure, state fair arena, art center, airport, Rio Colorado bridge, indoor stadium, Parrots-Ferry Bridge, where is that?

Lin: Parrots-Ferry Bridge; that's in California. A bridge that sags. And I was called in to study it. I didn't design the bridge but I corrected it. Yes. Anyway--

Swent: And then the Moscone Convention Center, the Columbia River bridge, and now Pacific Park Plaza; is that a building?

Lin: You see, this is interesting, because during that period of some, over twenty years, I was pioneering prestressed concrete and mostly in buildings. Since then, I did mostly in bridges. So this now leads to the bridge part. And in fact, the *Engineering News Record* citation of me as one of the 125, they put a note, "All these structural engineers have designed many bridges." So, there's another category they call 'Bridge Engineers'; I could have been listed on there. Now I tell you a story of bridge designing and building. This is a list of the famous world's civil engineers and architects.

Swent: This is actually from Spain, from Barcelona.

Lin: I don't know; I may be the only American there in.

Swent: *Design in Civil Engineering*. A beautiful magazine.

Lin: There's about fifteen or twenty people. They made it so beautiful. I think they are more beautiful than my real structures. But look at mine, starting from that page. There are eighteen pages of me and my projects

Swent: The interaction between architect and engineer. It says, "There was a time when architects called themselves masters of construction."

Lin: Yes. That's what Frank Lloyd Wright says.

Swent: And here, the Intercontinental Peace Bridge, proposed by T.Y. Lin. The Caracas Hippodrome. Interaction between artists and engineers. The Ponce Coliseum, Convention Center in Phoenix, the Garden State Art Center, Moscone, parking buildings, Bank of America--that was in Managua. The Holiday Inn in Chinatown. And the telecommunication building in Los Angeles. And the UICD building in Singapore--

Lin: That's the first prestressed concrete building in Singapore. I pioneered that, and now the greater part of all Singapore highrises is made of prestressed concrete.

Swent: Beautiful building. And here's Visitation Valley in South San Francisco. Those are apartment buildings.

Lin: Eichler homes.

Swent: And the projected American Pyramid. Was that constructed?

Lin: No. No.

Swent: The Lewiston-Clarkston Bridge. Chinese bridges. The Rio Higuamo Bridge in the Dominican Republic. Oh, this is a wonderful article!

Lin: Yes, that's the San Francisco airport bridge.

Swent: The Rio Colorado, the Singapore airport, and then the Gibraltar Bridge and the Bering Strait Bridge. Oh, and the Ruck-A-Chucky Bridge was mentioned. Beautiful article!

Lin: See, the Spanish publish beautiful things.

Swent: The photography and the paper; everything is just very elegant, isn't it?

Lin: Yes. Very elegant. Make my structures appear better. Anyway, I have lots of those articles; this one is most beautiful.

Swent: Did this just come out?

Lin: Oh, no, no. Ten years now. About.

Swent: Oh, it's a beautiful publication. 1988. Volume Numbers 7, 8. It's the magazine of the, I guess we'd call it the Institute of Engineering of Highways, Canals, and Ports, et cetera. Thank you for showing me that.

Lin: I don't know if you have a copy in the library. Maybe you don't. I think, I can get you some. But maybe this is only copy; then I cannot give you. Anyway, now let's go back to bridges.

Swent: All right. I'm a little confused on dates. For instance, the Phoenix Stadium and those major buildings, this was in the 1960s and seventies, was it?

Lin: More in the sixties. Some in the seventies.

IX BUILDING ARCH BRIDGES SAFELY, ECONOMICALLY, AESTHETICALLY

The Philosophy of Bridge Design and Construction

Swent: And then you began to go more and more into bridges.

Lin: More and more into bridges. I started in bridges very early in China from the railways, and then 1950 some, I started prestressed concrete bridges in California, mostly for the highways. I found out that with a new material or combination of materials such as prestressed concrete, combining steel cables with concrete, there are lots of things you can do. And you have got to have some new concepts, new ideas. You cannot always just use the old things. That's very, very important.

So when you look at the philosophy of bridge design and construction, I found out, which is common knowledge, that a bridge design must serve its function, what is the purpose, like bicycles or railroads or what. And do that safely, of course. Should not fail or collapse. And economically. That's a very important item.

But more recently we added another one--aesthetically. Then, aesthetic feature was prominent in the old days because the designers were architects or engineers. And they did not distinguish between the two. So anyone who designed a bridge must make it beautiful. They may not, but there's a purpose. But during the last century, particularly in America, we rushed our construction. We have only so much budget to build so many bridges. So we put emphasis on economy. And therefore mass production, et cetera. And almost forgot about aesthetics, in America. Of course, there are beautiful bridges, but in general, engineers didn't think about beauty.

Swent: I'm thinking too, and I'm not an engineer and I'm not an architect, but the old ancient bridges depended on arches--

Lin: We'll come to that--

Swent: --which are beautiful. You know, most of us think an arch is beautiful. But with all these new materials, you could do things that were much more angular.

Lin: Absolutely. So this we'll discuss later.

Swent: Yes. So the angles became sharper?

Lin: Well, more than that, you see. I will classify, later, all of my bridges and others into three categories--horizontal flat bridge; girders and so forth; arch bridges; cable bridges, hanging the other way. Essentially, all bridges belong to one of those three categories. Of course each of the categories has many variations. But we'll discuss that later. But now, I'll discuss the basic principles of bridge building. We in this country seldom emphasized aesthetics until the last twenty or thirty years.

##

Lin: I remember one of my previous students at Berkeley, Mr. Scheffey, he went to Europe; he came back and said, "The Europeans pay more attention to aesthetic bridges, much more than Americans."

Swent: Why should that be?

Lin: You see, Europe is a more mature civilization although we took it from Europe. They were not that rushed. And also, their engineers were trained more about aesthetics than we were. In our country, we have a rush of construction in the last century. We want to build fast and inexpensive. So that caused our thinking to concentrate on economy.

Swent: But does it have to be more expensive to be aesthetic?

Lin: Not necessarily. But of course, if you want to be less expensive, then it's likely that you'll be less aesthetic. That's another part of the interview; we'll discuss later about this. So we paid less attention to aesthetics. As a result, our bridges were standardized. And not much innovation or attention to aesthetics.

The Engineering Approach is a Global Vision

Lin: Now aesthetics in bridges can be classified into, very generally, two classes. One is the architectural approach to minor details--

railings, maybe colors, and so forth. Engineering approach should be a global vision of the bridge. To fit the environment and to express the structural forces and moments, and nature itself. I specialize more in this new global feeling of the bridge, but not as much in other ways to decorate the bridge. Also after I studied prestressed concrete and found out, prestressed concrete being in a way, a new combination of materials, it could generate better global look and features, generate new types of bridges. So as a result I started several new types. We will discuss this again. More in detail.

But at that time, if you remember, Lady Bird Johnson, [wife of] President Johnson, advocates beauty in structures when I just started prestressed concrete. So there are two or three structures in the Oakland area and San Francisco which we engineered with good expressions of aesthetics.

Swent: Was this when you did the 23rd Avenue Bridge in Oakland?

Lin: This is one of them. The 23rd Avenue Bridge, the Hegenberger Bridge, and the San Francisco Airport Bridge. So at that time, I was dealing with the so-called 'straight bridges'. That is, these bridges were sort of flat. Then, we went into the arch type and then to the cable type. The above three were the ones that I started with. Each of them has its special points. Now this sheet shows some of those flat ones--I don't know if flat is the word--bridges as versus arch or suspension ones.

Swent: These were all supported by piers?

Lin: Piers and their main body goes more or less level, horizontal.

Swent: They use the term cantilever--

Lin: No. Cantilever is part of that but the main thing is not cantilever; although there are several cantilevers.

Swent: I know they speak of the cantilever section of the Bay Bridge and that's sort of flat.

Lin: Yes. Cantilevers are in a way more flat than other ones, but--

Swent: But these are supported from underneath--

Lin: Yes. Supported from underneath, yes.

The Twenty-third Avenue Bridge: Curved, Strong, Beautiful

Swent: And the entire thing, both the support and the bridge itself are of prestressed concrete?

Lin: All of these. All of these happened to be prestressed concrete because I started it but there are many of those so-called flat bridges were built by many, many people long before I got into this. This is the 23rd Avenue Bridge, you see. The whole thing is curved. Very good looking. And to take earthquake, I had the piers pinned at the bottom, and that's bad for earthquake, but the whole thing is curved, and a pin here, a pin here, a pin here, the three pins act like a tripod. You see, they make it very strong. This has won a lot of awards.

Swent: This was unusual to do a curved bridge, wasn't it?

Lin: Yes. Yes.

Swent: That is, it was curved horizontally.

Lin: Curved horizontally. So this become a very beautiful bridge because we got the feeling of the way the traffic flows and the force flows and how to resist the earthquake with the tripod action. Then, the next one is the Hegenberger Bridge, shown by this figure.

Swent: Let me just point out how this bridge fared during the Loma Prieta Earthquake.

Lin: Not one crack. Absolutely nothing. It fared well. All of my bridges fared very well. And buildings too.

Swent: And this one was very near the freeway that failed.

Lin: Yes. Yes.

Swent: So it was probably subjected to similar stresses.

Lin: Yes. Yes. However, I always, I cannot boast of absolute safety against earthquakes, although so far, they have been good. I don't think I knew enough of it. I knew maybe a little more than others how to design against usual earthquakes. If it was a real big earthquake, I don't know what could happen. [laughs] Well, anyway. So this is the 23rd Avenue, which I did with good cooperation of the Oakland City Public Works Department; I can't think of his name now, but anyway.

The Hegenberger Bridge: Pioneering Waffle Construction

Lin: And then the next one is the Hegenberger Bridge. The Hegenberger Bridge pioneered in the method of construction. I found out it is a good way to build some bridges if you want to be economical. The Hegenberger bridge is a very wide bridge, so it requires prestressing or reinforcing in both directions. Along the bridge and across the bridge. So I invented, sort of, a new type of bridge--using waffles, waffle-shaped elements. In this bridge, you see, it's a waffle. I prefabricated bathtubs upside down--

Swent: Bathtubs!

Lin: Bathtub shapes upside down and put them one next to the other. Between the bathtubs there's a space, where I put in cables. It made the construction very easy and very economical--

Swent: Let me look at that picture again.

Lin: Look at that again. See, these are bathtubs upside down, one next to the other; we probably had a hundred bathtubs. Because it's a very wide bridge, and this, you know it was big, and built at a unit cost of about 20 percent under the ordinary bridges. Very cheap. It's easy to do! I prefabricated these bathtubs and put them on.

Swent: How were they fastened together then?

Lin: Okay. See, in between there's a space between one bathtub and the next. I put in cables. After I put in cables, I grout concrete to fill the space--I grout the space to form the whole thing into one piece. So made of hundreds of bathtubs but eventually grouted and prestressed into one piece. It's a beautiful way of designing and constructing! Many have imitated this idea since then. It was also used in buildings.

Swent: So these cables that were put between the bathtubs--

Lin: Right.

Swent: --were then stressed--

Lin: Right.

Swent: --and then the grout was poured--

Lin: Well, you grout first but you separate them from the cables. With plastic or something. You grout them and tighten them. This is a really beautiful way--well, it's typical of prestressing. Now the beauty of these two bridges were not entirely mine. My colleagues, and then architects; Warnecke is one. You know John Carl Warnecke? His firm were consultant on those architectural features. So there I cooperated with the architect, using new method of construction, making them economical and beautiful; at the same time, very safe. So it indicates what you can do with new ideas and new concepts.

Swent: Was there any opposition?

Lin: You see, it's very interesting. Once I got the job, nobody cared, as long as I got it done, no one criticized. But before then people may say something. Soon they begin to trust T.Y. Lin, so if I do this, they know it must be right. But at the beginning of prestressed concrete, I had lots of opponents. By the time I built those bridges, they were already quiet.

Now, another way of building these so-called flat bridges. You build a pier and cantilever from both sides until they meet as shown in these pictures here. This was initiated by European engineers, such as Leonhardt, for example. And the French people also. Such cantilever construction takes away all the false work otherwise required, because you build the piers, you don't put any false work, temporary work, between the piers. You simply stick out, cantilevering. Look at these cantilevers here. This concrete sticks out three hundred feet! They stick out by themselves, but are actually held by cables on top of the deck. This is a very important method of construction started in Europe. Now, there are two ways of building this. One is, by putting a slip form, a horizontal slip form, and the form goes out horizontally while you place concrete and tighten them with cables. This is called horizontal slip forming.

The other type is precasting, like this picture. You cast the bridge in segments--called segmental. And then put them together at the bridge site and tighten them with cables. All of these are made possible by prestressing. And here you pick up those precast pieces and tighten them together. This is very popular. I happened to be the one that started this type in a big scale in America. But I copied it from the European engineers.

Swent: How did you learn about it?

Lin: In civil engineering, we publish our works, they are open. I get it from publications or went to a site, and so forth.

Swent: Did you go to Spain to visit bridges?

Lin: No. But you learn this without being there. They're all written in the papers. Like this one for the Higuamo bridge in Puerto Rico. It sticks out 300 feet. And then the next Snake River bridge. The Europeans started it, and as I said, I was among the first to copy it, either in place or precast, and this is very popular now. Throughout the world; they all do this now.

Swent: Did these bridges also use the waffle-type construction?

Lin: No. No. These are boxes.

Swent: That's different then.

The Idaho Bridge: Prestressed Steel Girders and Concrete

Lin: Then, I started another type also. Prestressed steel girders. This is very economical, but as yet, not many people know how to do it. I did it. But it never got too popular. I don't know why. They have not learned it. Okay. Here, the Idaho bridge.

Swent: Is that the Snake River?

Lin: Not the Snake River; its the Bonner's Ferry Bridge, Idaho. That had steel girders. And on top was a concrete deck. Then I put in cables in the deck over the piers to prestress the girders together.

Swent: Sort of lacing them together?

Lin: Lacing them. This is really quite simple. As shown by this picture which shows I simply copied the prestressed concrete anchors and attached them to steel. How to get the two to work together is a little tricky, which most engineers would hesitate to do. Because concrete shrinks and steel does not. So to make the two work together, properly, is a little tricky.

I would recommend using precast concrete deck. You have steel deck, use precast concrete--which already shrank--and lace the cables inside to stress them together. So this case, in Idaho, was bid against another big firm, designing in prestressed concrete; while I designed in prestressed steel. And we were cheaper by 20 percent. But even so, it's seldom repeated. I don't know why. Just a new type of design that engineers hesitate to do and I have not spent effort to publicize it.

Swent: You think all it needs is just more publicizing?

Lin: Yes. And more teach; showing ways of designing, and so forth, so engineers would know how to do it. But I didn't spend that much time in this.

Swent: Where would you publicize something like this?

Lin: Generally, in technical papers. All of my jobs were written in papers which you have some, maybe not all, in the library. And they publicize for people to see. For prestressed concrete, I wrote papers and a book and set up codes and meetings and give talks. All these help publicizing.

Swent: Set up codes?

Lin: Codes. Building codes. I spent a lot of effort doing that for prestressed concrete. But I have not spent nearly enough time on prestressed steel.

Swent: What role would your teaching have played in this?

Lin: You see, in my teaching, I got my students "brainwashed," and so forth. But in teaching, you only start with the primitive ideas. Getting into prestressed concrete, which I did, is as far as I could go. Prestressed steel is a step ahead. It's really prestressing steel and concrete together. It really is a combination of steel beams, concrete deck, and cables.

Swent: Putting them all together.

Lin: Putting them all together! It's a little tricky as I said, but there's really nothing to it. It cannot save every job, but for many cases, it will save a lot of money. Now we have another case of a prestressed steel arch which we'll discuss soon. So far I call them flat deck members.

From my point of view, it's technically correct and mentally appealing. And then it will, aesthetically, be also appealing. Next, we'll go to arches.

You take a look, just get an impression of some arches that I have designed.

Swent: All right. Oh, these are lovely. Beautiful. These projects: were they all done?

Lin: All done! All these were done. I think I designed many beautiful arches. The most well-known arch bridge engineer was Mailliard. You've heard of Mailliard? Mailliard in Switzerland. He did beautiful concrete arches. Very nice. Fine and refined. Very well known.

Swent: Mailliard was the name of the builder.

Kwang Du Bridge: Three Arches, High-Strength Steel

Lin: Mailliard was a very well-known engineer about a century ago, in Switzerland. I got into arches, fortunately, again, with the new material of prestressing. Prestressed concrete and prestressed steel. But basically, it's a matter of the arches. The one that I like the best is the Kwang Du steel bridge. It's not prestressed concrete. Which is shown on the attached slides.

Swent: Ah yes! This is Kwang Du?

Lin: Kwang Du bridge in Taiwan. See, this one I think everyone agrees is beautiful. And here, I started very interesting ideas. Without using prestressed concrete, nor prestressed steel, just plain steel; it's high-strength steel.

Swent: So this was high-strength steel, not prestressed.

Lin: Not prestressed; high-strength steel. Each of three main spans is almost 600 feet. When I compare this to my previous jobs in China, see those three arches, down below, each about sixty feet span. Ten times!

Swent: But were those steel also?

Lin: This is all concrete and stones. And stones. In China. These Chinese stone bridges were built about 1939.

Swent: When did you take those pictures?

Lin: At that time.

Swent: You were taking slides in 1939!

Lin: These slides were made from old photos. Did I tell you the story of becoming chief bridge engineer for the railroad?

Swent: Yes, you did.

Lin: Yes. It's interesting. So, we set up several sets of basic designs, for a thousand bridges and culverts on the railroad, as chief bridge engineer. This is one of them. They have all those concrete arches and stone piers. Very old-fashioned. We did not even have enough cement, so we put cement and lime mixed together and built those. They're still standing there now. Now you compare this to those steel bridges, ten times longer in span. So I wanted to make a real beauty out of this Kwang Du Bridge. First, the background is perfect.

Swent: Yes. I was thinking of that.

Lin: The green mountain or hill is behind, with the red painting. That's pretty. And next, there has always been steel arches anywhere, but no continuous arches of three spans. That's very unusual. The reason was, once upon a time, we engineers would not know how to analyze a continuous arch because one arch was tough enough for us to study. Three arches was considered impossible. When I was a student here, just one arch was considered very difficult. Required several simultaneous equations. But now, with computers, thirty arches are nothing! So I put three arches all continuous in one piece. That makes it very strong.

Swent: They brace against each other?

Lin: They brace against each other, but one cannot do that because we don't know how they brace each other, but now with computer this is no problem, so I took that challenge although I didn't use computer myself; my colleagues all do; they did the work. So I make this three continuous--

Swent: To go back to the paint color; the red paint is for rust proofing, isn't it?

Lin: Not really; any color can be okay against rust, but red stands out impressive against the green hills.

##

Swent: This bridge is in Taiwan; how had you kept your contacts with the people in Taiwan?

Lin: Well, we had a whole office there, with 150 people, and even now.

Swent: You left Taiwan in 1946 and then you went back?

Lin: Oh, I went back many times. Maybe ten times, twenty times. But I didn't do work myself over there. Only top people wanted to see me. The president, the engineers, all those and the others of my people, Y.C. Yang and Ernie Loh were in charge. They did really all the management. All calculations and drawings were carried out by other people, but the important ideas mostly came from me.

Rio Colorado Bridge: Inverted Arch, Prestressed Concrete

Lin: Okay. Now, the next bridge I'll talk about, of the arch type, is entirely different. It's an inverted arch, or as *Engineering News Record* calls it, 'upside-down arch'. Here, we had to cross the Rio Colorado in Costa Rica with a bridge about five hundred feet long. The ravine is over 300 feet deep. Now, if I build from bottom up, using falsework, it would be very expensive. So I worked out to build the whole bridge from top down. First, since it's a ravine with no traffic, no boat, so I put the entire arch below the deck, like the Golden Gate Bridge, much smaller of course, but all below the deck. Golden Gate needs to be raised above, so ships could go below. But in this ravine, there's no ship. Just water. Maybe twenty feet of water. It's a few hundred feet deep. So we had all the space underneath.

Although a much smaller bridge did like the Golden Gate Bridge, putting the cables through. At first, I thought we'll hire a helicopter to carry the cables, but they were just pulled through anyway. After we pull several cables through and supported it on the ends, then everything was erected from top down. They were all precast pieces in concrete. This whole bridge was prestressed concrete. All the members were designed, prefabricated at the site, and moved to the job. Different pictures show we pulled the cables across. Then you formed a ribbon, and worked from that ribbon to put on columns and beams. They are all handled from the highline above, i.e. a highline cable. The whole bridge was built for something like two million dollars, very cheap. Now, this is my artist's sketch.

Swent: Oh, that's what is over your fireplace.

Lin: My artist student made the painting. See, here. More than that, we designed the piers to be inclined. Why? Because it kicks into the mountainside and stabilizes it. Besides, it looks good. So here's an inclined pier, then you put the cables across, and put pieces on and tighten them together. So this is a great achievement of a small bridge, 500 feet long.

Swent: How did you get the cable across in the first place?

Lin: Well, I thought we could by helicopter, but they got it pulled across.

Swent: I don't understand how you could.

Lin: Cables are very light. They were laid on the ravine, pulled along the land, and then lifted up to the other end.

Swent: Oh, okay. Somebody went down to the bottom of the ravine and then pulled it across and then you put the prestressed concrete pieces on the cables.

Lin: Yes. And formed a ribbon; and then, columns on top of the ribbon.

Swent: But descending columns?

Lin: All descending from the high-line.

Swent: I don't understand why you need the columns--

Lin: Well, look at our deck here. Five hundred feet. It cannot support itself. The deck has to go from the columns to the ribbon.

Swent: Oh. Okay. Now I understand. And the inclined piers at the ends go into the mountainside.

Lin: Yes. Yes. World famous, this bridge. They couldn't believe this kind of thing can be built. But it's done! It's done! We engaged an American contractor to work with the Costa Rican people.

Swent: Did you submit a bid for this? Did you get this by bidding?

Lin: No. This is because my friend who was president of my firm, Felix Kulka, he had good friend in South America. They just gave us the job to design.

Swent: Without even bidding?

Lin: Without bidding. He said, T.Y. Lin is famous, and has good ideas. Kulka and Y.C. Yang carried much of this out. But again, most ideas came from me. But they did the work. They were very helpful in those jobs. And Dr. Kam Lo did all the calculations concerning the building process. When you put a piece on, if the cables moved the wrong way and then what will happen? All this was computed.

Swent: Have you been there to see it?

Lin: Yes. Yes.

Swent: That must have been a pleasure.

Lin: Now, why do I call this an arch? An inverted arch? Because I put additional cables along the arch to tighten the whole thing together. So that it will be a ribbon. And now after completion, the next day, Margaret and I went to see the site, to see the job. When we got there, the local South American people said, "Hi! Professor Lin! We tested your bridge yesterday."

"What did you test it with?" They ran a--I don't know how many tons--120 tons or something--big heavy crane over it. I think it was a 120-ton crane. The bridge was not designed for that much. But they tested it and everything was okay. They said the bridge sagged about one inch when the full load was on. Then when the load left, it rebounded. Because the whole thing had been tightened. They did the test without my permission and came out later and said, "Look at this: oh, it's okay." When we got there it was already tested. [laughs] So Margaret went with me, and we were surprised. You see, South American people have great trust in me, because I've designed many of their bridges. Not as spectacular as this one, but also because of my book, also in Spanish. So T.Y. must know what he's doing.

Swent: This was built for just ordinary automobile traffic?

Lin: Ordinary. Two lanes, or what, I can't remember. Not for huge truck. It was tested way over the offical loads. Could have been 120 tons. But it was amazing. This is what you have to do in engineering. You have to be prepared for people who don't know anything; you have to be able to take all this. All of my structures had taken those unexpected loads without any problems.

Swent: That's what I was thinking. All the vehicles now--the commercial vehicles--are all getting bigger, and bigger and bigger.

Lin: We will design for the bigger commercial vehicles, not just automobiles. But not the one they put on; that's at least twice the permissible load. When you put on the loads, the bridge began to move. No problem. If you went too far, then it collapses. Fortunately, that never happened to my bridges.

Okay, next one. And, the top one, Kwang Du, they have a stamp made. We have three postage stamps in Taiwan. This is only one of our bridges. Now, the Costa Ricans made a postcard out of this bridge. I should have it. Anyway. Let's continue along the theme of arches.

Twin Cities Mississippi River Bridge: Steel Arch, Double Cantilever

Lin: The third one is the steel arch. And that steel arch in crossing from Minneapolis to St. Paul, across the Mississippi River. Two cities got together and want to build this bridge. They engaged our firm.

Swent: Did you bid on that?

Lin: I think this one was not bid. They just know the name. We made eighteen designs, with steel, concrete, up and down, right and left. And they chose this one. It is a steel arch. I think they like steel. Also, there was an old bridge there. But this new arch becomes a local monument, now. You take a look at this figure.

Swent: I've crossed that bridge but I didn't realize that I was crossing one of yours.

Lin: It's very high. It's 150 feet high, or something, above water. Now, this bridge is all steel. So I worked up a different idea for the bridge. But I have half arch, full arch, and another half arch, all tied across the deck. Instead of tied down in the river, which is no good. So I have 250, 500 feet, and 250: total, a thousand-foot cable tied across, in the deck. To make the bridge very stable. They chose that one out of the eighteen designs we made.

Swent: So there are three arches--

Lin: Three arches, one central, half right, and half left. And tied across. Can you imagine these arches tied across the top and tightened together?

Swent: So they are tied along the top?

Lin: Along the top, in the deck. More than that. I used the ties to build this whole bridge. How? During construction, this 250 plus 250 feet becomes a double cantilever. And after that, they were tied across, and became a very special kind of arch. During construction, I had these cables, hang them up, cantilevered. You see, American are contractors very smart. In my opinion, the contractors are smarter than the engineers in general. Not in computing, but in construction, very smart. They know how to construct the structure. The constructor is very smart. I have yet to find a constructor who will refuse to build my bridge. When I discuss with them, I don't know how to build it. I give them the idea and they know how to do it. Engineers will talk too much on analysis, numbers, computers. They do not know how to handle a real job. I am much better than the usual engineer, because I served about three or four years as a contractor in China, not here, so I have some idea how to do that. And this bridge is fabulous; it is prestressed along the deck. The Moscone Center is prestressed in the slab down below. That's natural. But to do like this bridge: that's not natural.

Now it looks very good because you look at the arch lines, the 500-foot arch lines, 250 feet, into a flat approach at either end. So the whole curve is a smooth line. The arch does not end abruptly. The line goes from full arch, to half arches and then onto the girders. Very smooth. This kind of thinking is important to structural aesthetics. No engineer has ever done this before, because I have the cables and I know how to use it, to prestressed concrete and/or steel. So this was built. And becomes a local monument. People are very happy.

Swent: Has this been copied?

Lin: Not that I know of. But it's all published, so people should have copied it but we got this location which needs is a high bridge, an ideal monument. Engineers may copy it later.

Swent: Change is slow.

Lin: Change is slow.

##

Lin: The deck is concrete. It's not really in a way. The arch is steel and this is concrete. And cable is in here. So they all work together.

Swent: All work together. Yes. Then was the cable tightened?

Lin: Oh yes! Yes! Because the tightened force goes all the way across the arch and also across the deck. They act together. That would have been difficult, almost impossible to analyze in the old days. Now, with a computer it's easy, but still people don't understand. For example, it must consider the shrinkage of concrete. Which I know a lot. Most of the prestressed concrete structures I designed for shrinkage and creep and that had to be done, of course.

A Bold Bridge Design in Prestressed Concrete in Taiwan

Lin: Okay, now another one of the arches. Suggested by an engineer in Taiwan after they've seen this bridge. They say, Professor Lin, you are a prestressed concrete man; why do you prestress steel? That is in competition with concrete. Can you design a concrete bridge like that? So I did it. It's very interesting.

Now look at these two pictures. They are not exactly the same.

Swent: Yes. But similar, and this was in Taiwan.

Lin: Yes. In Taiwan, also 500-foot span. And I said, You know in steel I have all these spandrel columns to hold up the deck. Get rid of those columns! So I got two big triangles there, with no columns. No columns in triangles to support the deck. Because I had these draped cables on top of the bridge in the deck. Now here is 500 feet, here is 250, here is another 250. My cables draped over these these triangles to support the deck. So I took out all the spandrel columns. So I saved all the columns and it looks very strong.

Then I met Taiwan President Lee Teng Hui; he said, "I went to see your bridge three times before it was finished. It looked so bold." They made a stamp of this bridge

Swent: A postage stamp.

The Bay Bridge East Rehab Should Use Arches, Not Stilts

Lin: Now this type of structure I would propose for our Bay Bridge East rehab project. The east section is being redone, with what we call highway on stilts. You heard of that?

Swent: A highway on stilts? Yes.

Lin: It should be a highway on arches, much more beautiful and seismic resistant. So at the last meeting of the Bay Bridge Board members, I raised this idea. I said, however, this is too late, and I'm not going to fight for it, but I think we should have designed it with a series of arches.

Swent: It would be lovely.

Lin: Yes. It would be lovely, and it would cost less. That they don't know because I would have saved all the columns. It's a long story to tell. But I told the whole crowd, I said, "This is better looking, and more economical. I'm not going to fight for it, because you have a schedule to go by." You cannot fight the bureaucrats. They just want to get it done.

Swent: T.Y. Lin International, however, is doing the designing, aren't they?

Lin: They do it but they take orders from our committee. Our committee has already approved the stilts, so they will do just that. They mostly agreed with me, but they cannot do it.

Swent: No. So it will still go under your name, even though it's not your design.

Lin: Yes. The firm is not my own any more. I'm in no way. They don't have enough good people to do the better design, which requires ingenious thinking and how to build it. Now for example, we constructed this one in Taiwan, which could have been similarly built for the Bay bridge approach, using the multiple spans.

Swent: Well, it's too bad.

Lin: You cannot get every bridge designed the way you like. You just cannot. Because it takes a whole mass; you have to to transform the whole mass of people, politicians and everything, to do the right thing. In South America and Taiwan it's easier. In this country, it's difficult to put a new thing through because we have set systems of our own.

Swent: Yes. Where there is a totalitarian government, it makes it easier--

Lin: Yes. Yes. [laughs]

Swent: Democracy just muddles things up, doesn't it?

Lin: Yes. It's good and bad. Everything has two sides. Oh, by the way, in the East, across the Potomac, they're building a Woodrow Wilson bridge. I gave this idea to them and they liked it, but they gave the job to someone, Parsons Brinckerhoff, a big firm. They used this idea, but carried it out in a very clumsy manner. It's been done. And it's a multimillion dollar job, but not well carried out.

Swent: Is that being built now?

Lin: Been designed. And I had no power to fight for it. *Engineering News Record* called their design "a timid approach to a great idea" or something like that. The idea was very good. But they are designing it in a timid fashion, looks clumsy. I just told you about the Kwang Du Bridge; I put all of the details together, and I have my colleagues who understood me, and one another, to carry them out. So it was beautiful. But when you take my idea and get a bunch of people who don't know anything, they cannot produce the right design.

Swent: It has to be carried through from start to finish, doesn't it?

Lin: Yes. Otherwise spoiled. *C'est la vie.*

Swent: Yes.

Lin: [sighs] I think that's all for arches. Next go to suspension cables.

Swent: I have a question: Cable-stayed and suspension are not the same?

Lin: No. Suspension is usually like the Golden Gate Bridge.

Swent: And the force is hung from the piers.

Lin: Now cable-stay is a series of independent cables inclined hanging up the deck. Smaller cables. The suspension bridge usually consists of two big cables carrying the whole deck, while cable-stayed bridges have many small cables.

Swent: And many of your bridges were cable-stayed.

Lin: Well, yes. Nowadays this is the latest invention, so-called cable-stayed bridges. I didn't invent it but I used it. The Ruck-A-Chucky is one we'll talk about later; it was a cable-stayed, and it cannot be done with suspension. Long story to tell. We thought of suspension type, but it wouldn't work, so finally cable-stayed. Cable-stayed is generally cheaper. The stayed cable carried the loads up and push back on the deck. The deck is under compression. The cables are anchored at the ends. But for real long spans, the cable-stayed will not work yet. Like the Golden Gate is too long for it.

Swent: Yes; the Bay Bridge uses suspension for part of it.

Lin: Yes, that's the one I suggested using cable-stayed. They changed it to suspension. You know how much additional money they will pay? At least fifty million dollars. They admitted--they did not say--it was more than that, maybe seventy million dollars to make the cables curved instead of straight. They say we will do it in harmony with the Western suspension, with the Golden Gate. I think it's silly. I declared, if you built it, "It's a monument to stupidity."

Unbecoming suspension--very ugly suspension bridge. Suspension should be anchored, but then stop at the deck. It's designed orginally for cable-stayed. But they changed it to suspension. Make it very ugly and more expensive.

Swent: But technically it works.

Lin: It will work but at large additional cost. It will require strong falsework support to build it. It's ugly. It's ugly to technical eye. Maybe the architects enjoy it; "It looks like the Golden Gate." Doesn't look like Golden Gate! It's only half of the full span.

Swent: But the other section of the Bay Bridge though, the one that's there, the West, that is a success--

Lin: That's very nice.

Swent: You were talking about the East one that they are planning to rebuild. That they have not designed yet. It takes a lot more than just engineering, doesn't it?

Lin: Yes. Yes. We now have a big fight in China, across the Yangtze River. The local people want to build a suspension. It should have been a cable-stayed. So there's a big fight.

Swent: You built the one over the Hwang Pu.

Lin: I proposed it.

Swent: Are you hoping to build one across the Yangzte?

Lin: Still debating. I had two letters from the Provincial Office threatening to sue me, "You declared that our design is no good. It's a disgrace to the country. A disgrace to us. We are good engineers. You must retract your saying."

So I just reply yesterday, "If you understand the situation, you will be on my side."

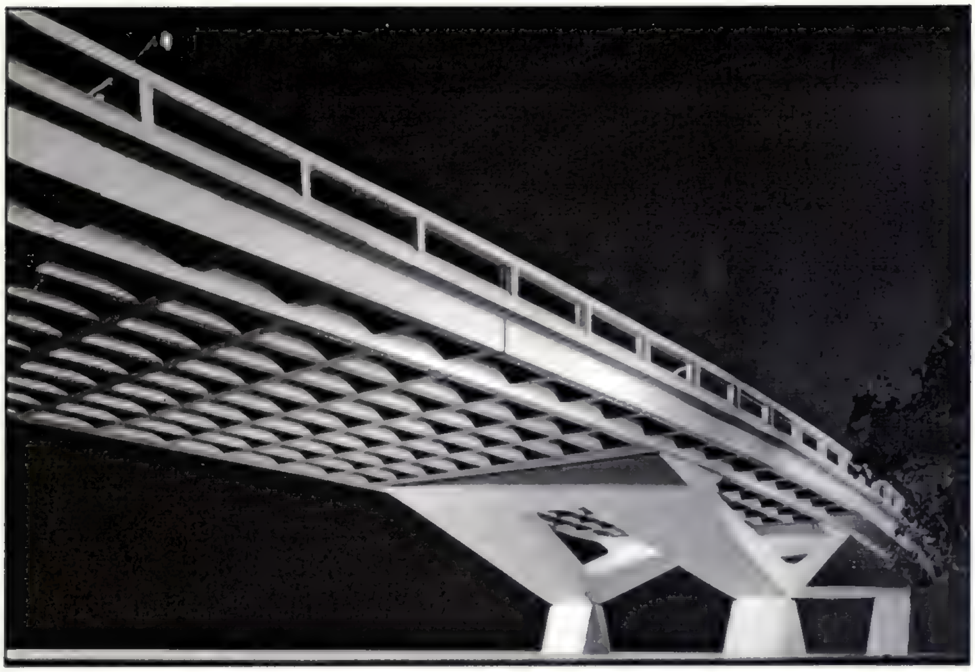
Their lawyer said, "You have got to understand they are spending another sixty million dollars more to do that and set it up." We'll see. Sometimes I have to fight and sometimes I have to give.

Swent: You can't win them all, as they say.

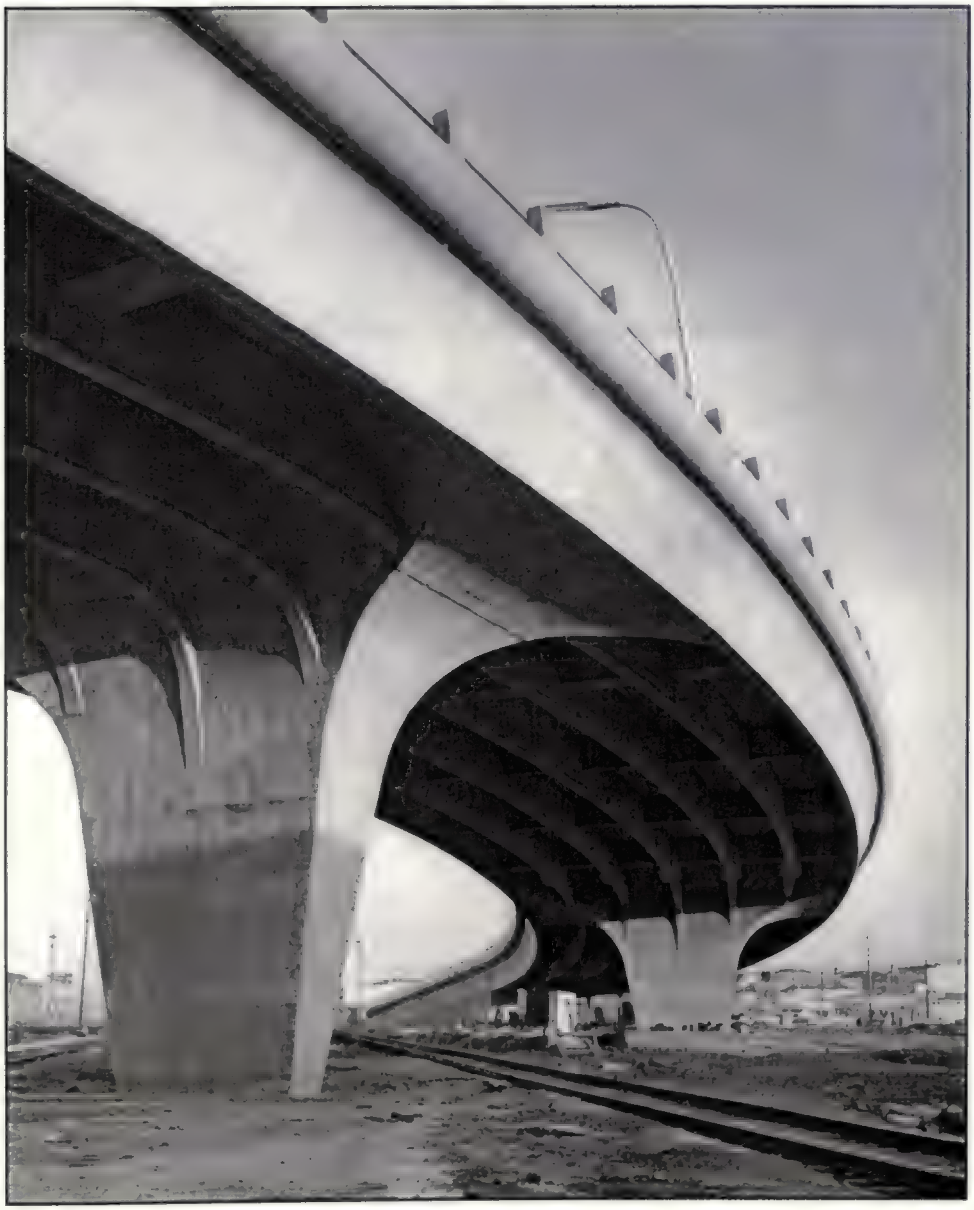
Lin: Can't win them all. Next time we'll start with the cable-stayed bridges.

Swent: We'll have a lot to talk about next time.

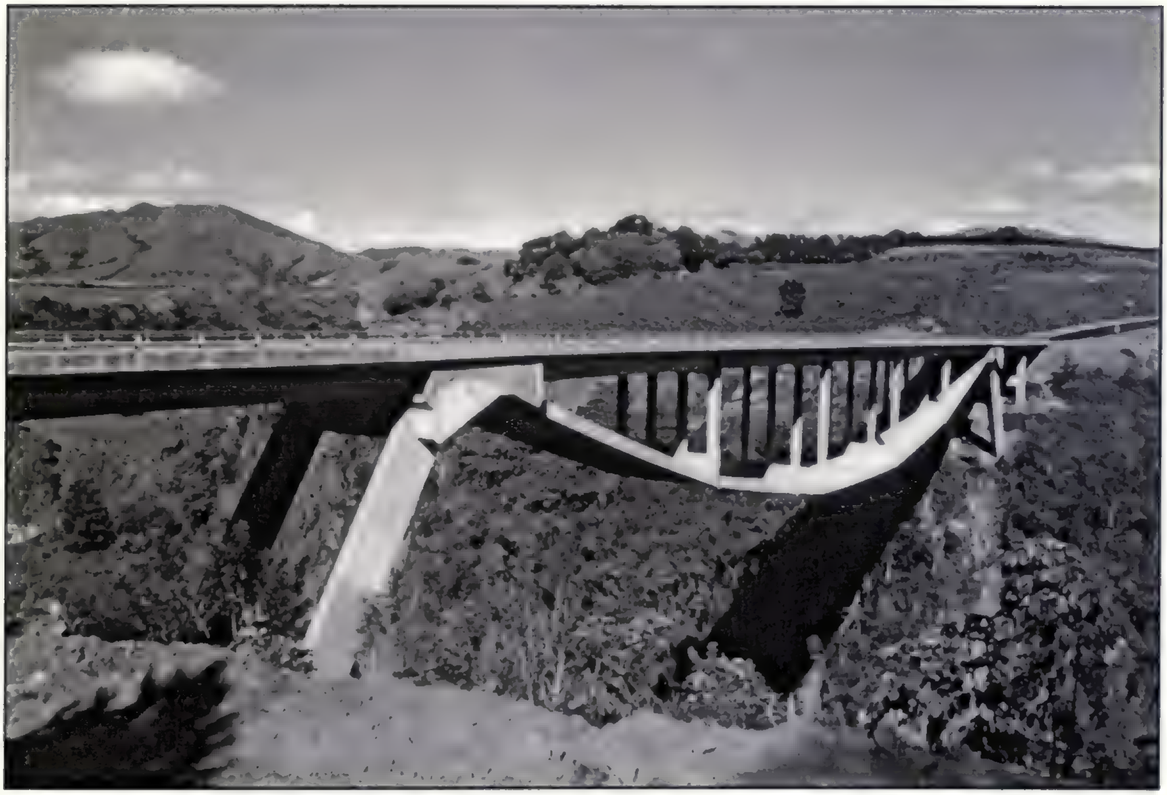
Lin: Yes. Next time is a week from now.



Hegenberger overpass, Oakland, CA. *Photo by Gerald Ratto.*



23rd Street overpass, Oakland, CA.
Photo by Kaiser Graphic Arts.



Rio Colorado Bridge, Costa Rica.

Ruck-a-Chucky Bridge.

T.Y. Lin receives the National Medal of Science from President Ronald Reagan, and in turn presents his plan for a Peace Bridge across the Bering Strait, 1986.

X BUILDING CABLE BRIDGES

[Interview 8: September 14, 1999] ##

Suspension and Cable-Stayed Design Compared

Swent: This is our eighth interview. And I see that as usual, you're well prepared with some slides all ready to illustrate what you're talking about.

Lin: We're going to talk about cable bridges.

Swent: Let's talk about cable bridges, then.

Lin: Yes, as I mentioned last time, there are essentially or basically three types of bridges. The flat type, being the girders, the arch type with the curve, and then the cable type being hung up by cables.

Swent: And we just were talking earlier before the tape that a beam can also be arched.

Lin: Well, if a beam is arched; you may call this an arch, but may call it a beam. But really it's an arch. All the bridges may not belong to the three categories. They may belong to combinations or variations of those three categories. Just to simplify them I divided them into three. Now we talk about cable bridges.

Swent: Is this the same as cable-stayed?

Lin: Not quite. Cable bridge would be the general term when they use cables. Now cables are used in two ways. One is, you hang the cables in the catenary fashion, like the Golden Gate Bridge, where the cable is one rope which stretches over thousands of feet in the same shape, and same section; the big cable goes all the way from one end to the other. It's a suspension bridge. That was initiated probably by the famous German-American engineer John Roebling. Now he first used it on the Brooklyn Bridge, and that's used all over the world; first pioneered in the U.S.A. and followed very much in Europe, and later on, Europe and Japan went ahead and have longer spans than we.

Then about, I would say, about a half century ago, another bridge type was introduced using the cables. The cables are used in straight lines, and hang on the tower with the straight cables, inclined. Then you hung the deck from the lower ends of the cables. So these are called cable-stayed bridges, "stayed" meaning "stabilizing". These are the two main types, and as I said, there are others. And the one I proposed for the Gibraltar bridge was a combination: partly cable-stayed, and partly suspension. We'll talk about that later.

Now go to the two types. I cannot recall if I designed any suspension bridges as such. More recently, my colleagues, OPAC Engineers, Mark Ketchum and Kwong Cheng, these two are the owners of the firm. Both were chief engineers of my old firm. They left the old firm and formed their own. They designed the Berkeley pedestrian bridge. I served as a consultant.

Swent: That's the new bridge. The new foot bridge across Highway 80.

Lin: Yes. In Berkeley. They like to use my name. "It's T.Y. Lin who designed it." Actually the two of them did. They call their firm OPAC. So, in the field, you see the two types of cable bridges. One would be the curved one, called suspension; it's suspended. The other type would be cable-stayed, pulled straight cables up to the tower. So the suspension appeared in one strong line, curved, like the Golden Gate Bridge. The cable-stayed is used all over the world now.

Swent: And how does this differ from Roebling's suspension?

Lin: Yes. You see, Roebling's suspension has one cable, essentially, curved like a catenary, while these cable-stayed had many cables hanging straight up to the tower. They look entirely different.

Swent: I see. Very different.

Lin: The cable-stayed sort of started about half a century ago.

Swent: And what's the advantage of it?

Lin: You see, it's much more economical than the suspension for two main reasons. One is, the cable-stayed tied the deck directly to the tower top. The force is direct; you pull it up there. Thus save money. And the suspension has a uniform cable that is carried all the way through, and therefore, every place, the cable is big. Like the Golden Gate, using three-foot-diameter cables, all the way through. But the cable-stayed, at certain places only have one small cable; you get two cables, three cables, four cables, et cetera, so the average is much less.

But the more important thing is the matter of erection. It's very important in bridge engineering to know how to build it. Roebling started this type where the cables span across and then he hung on the deck, on the catenary. So you have to finish the cable first; then you hang up the deck.

In the cable-stayed type, here is the tall tower and you hang a cable up directly to the top. Then another piece follows up. Each piece is hung by itself. It does not require a ground anchorage. Now the Golden Gate Bridge has a catenary and is anchored at both ends. Now if the ground conditions are good, the anchor will take the force easily; e.g., a rock foundation, like the Golden Gate. But in places, you don't have rock; you cannot anchor it. Then you can easily go to the cable-stayed type. Because cable-stayed hangs the cable up and takes its compression into the deck. The deck carries the compression. Erection is very easy. Each piece is hung up and you finish the whole bridge. So the way the force is carried, it is more economical.

As a result of the cable-stayed construction, many new cable bridges, in the last few decades, were built of cable-stayed and not the Roebling type. The Roebling type became sort of out of fashion. It still has its place. For example, on very long bridges, it's much better to anchor them into the rock, if you have rock foundation, but the deck cannot be compressed too hard when the bridge becomes long. So the cable-stayed has its limits, say not over a kilometer or something. It may take too much deck to carry that compression. That's the general situation.

Now, as an engineer, I look at it another way. A cable-stayed bridge is a post-tensioning of a prestressed bridge. You see, you have the cables here which tighten the deck. It is prestressed.

[telephone rings; tape interruption]

Swent: So you were just saying that there is a limit of about a kilometer?

Lin: About a kilometer. A cable-stayed may not work much beyond that.

Swent: Could you double it? Could you put two together?

Lin: Of course you can do a lot of things, but it may become not economical. Now, my career in design of cable-stayed bridges started in Taiwan about forty years ago.

Y.C. Yang, Right-Hand Man for Fifty-Five Years

Lin: My colleague Y.C. Yang was there. He did most of the work, with Ernie Loh. I generally supplied the concepts. The idea.

Swent: Was Y.C. Yang one of your students?

Lin: No.

Swent: No. He's a contemporary of yours?

Lin: Contemporary. He worked with me together for fifty-five years now.

Swent: How did you meet him?

Lin: He came from my old alumni school. When I was working in China on the railroad, I had a very difficult time, during the war. I needed a helping hand. So I wrote to my alumni, and they chose among all the applicants, chose him, about 1943. He has been working with me ever since then. And succeeded me as chief engineer, president, board chairman of my several firms, the old T.Y. Lin International, and now on my Lin Tung Yen China. So we've been working together for many years. He's an old alumni of mine. A very capable engineer. He's involved in all kinds of things. He's the board chairman of a bank, National American Bank. Big name. And he does many things, including being my right-hand man for many years. Okay.

Kwang Fu, First Cable-Stayed Bridge in Asia

Swent: So this was your first cable-stayed bridge in Taiwan.

Lin: First cable-stayed bridge. And in fact, it's known to be the first in Asia. So I have to make it easy, easy for construction. The place across the river needed two main spans, each 500 feet long. Which was not an awfully long bridge for cable-stayed. I made use of the local production capabilities, and this is my strength, using local strength. They already produced girders, 125-foot long apiece. So I make four of these girders in a row, and accomplished the required 500 feet; at each junction of the girders I put a cable and hang them up, cable-stayed them up to the tower. So the two towers were 500 feet apart. There are two sets of cables and they hang towards the junctions to hold up the girders.

Swent: How do you fasten them at this junction?

Lin: These are details that have to be worked out. They are all worked out, of course. We will not discuss here; that's a long story to tell. Engineers should know how to do that. Anyway, they will make, say maybe, basically four beams, each 125 feet long, go through the whole 500 feet. At each junction, we put a cross girder, and the beams rest on the girders. And from the ends of the girders hang them up to the towers. And it become a great success in Taiwan. Very economical.

Swent: And everything was made right there?

Lin: Yes! And the girders were made in Taiwan, but not necessarily at the site. They were shipped to the site and hang up to rest on the girders. The girders were supported by temporary trestles. So I have two supports here; I put temporary trestles supporting the girders which supported the beams before they were hung up. Very simple straightforward construction, very simple and very cheap. And the Taiwan government again made a stamp for this bridge.

T.Y. Lin Accused of Being Anti-Communist

Swent: Made a stamp of that too. And what was the name?

Lin: The name is called Kwang Fu. Now, Kwang Fu means recovery, resurrection.

Swent: Oh, that wasn't the name of the river.

Lin: No. Now, apparently, the Taiwan government named that as Kwang Fu to indicate their recovery of the island from Japanese occupation. Now when the Chinese communist government first came to America about 1975, I entertained them, in my home, right here. The current mayor of Shanghai, and their KGB were very unhappy, said, "Professor Lin, you mean to recover the Mainland. That's bad for Taiwan to use that name."

I said that was not my intention. The real name of Kwang Fu was not given by me, was given by the government. It was not intended to recover mainland; the intention was that Taiwan was taken back from the Japanese. But these things can be misinterpreted and that time it was. So when I had that meeting, they say I'm anti-Communist. You remember before, I told you the story in Taiwan which treat me as a communist. Did I tell you that story?

Swent: Yes, you did. So you were attacked from both sides.

Lin: From both sides. But I can't let it bother me--

Setting Up Foreign Branches of T.Y. Lin International

Swent: But tell me how did you happen to build this bridge in Taiwan? Were you approached? Did you bid for it?

Lin: Most bridges in Taiwan, we did not have the bid. We have established a firm there and the firm is well known. When the government got a tough job they came to us.

Swent: When did you establish this firm?

Lin: I would say maybe thirty, forty years ago. As a branch of San Francisco's T.Y. Lin International.

Swent: You actually had an office in Taipei?

Lin: Oh yes! It's called T.Y. Lin Taiwan. We built many bridges. I think we built and designed more than anyone else.

Swent: I'm interested in how you established relations over there with the Taiwanese government and so on.

Lin: Okay. We used almost all Chinese people there. We sent over a good leader, Y.C. Yang. As head of the office he would set up more people, enlarged the firm as time goes on. And we did everywhere.

Swent: Did you make use of former students?

Lin: Many, but not always. Then we have set up in foreign areas. T.Y. Lin Mexico, T.Y. Lin Singapore, T.Y. Lin Taiwan. T.Y. Lin Hong Kong during the last thirty or forty years. All start up with one, two, three people and then grow up to fifty or a hundred people. So they are all local people, headed by people whom I knew, who have worked prominently here, sent over to be the head, and they gather local talents, et cetera.

Swent: How did you communicate with these groups?

Lin: Well, at that time, telephone, telegraph. Everything.

Swent: Did they report to you?

Lin: You see, when I establish something like that, they hardly report to me. Not much. Only my central ideas were conveyed. And they did whatever they wanted to. I don't care what they use, what they do. I can trust them. But generally, the concepts came from here. This bridge should be built this way and they can build it. Because the chief in charge knew me. And that's how it was carried all the way through.

Swent: Did you have regular conferences with all of them?

Lin: Yes. Yes. We have maybe an annual conference in San Francisco or sometimes in Taiwan.

Swent: They came to you.

Lin: They came. Yes. But that's not important. The important thing is I appointed a chief there who knew me and whom I knew. And the chief carried out the whole thing.

Swent: How did you manage the financing among all of these?

Lin: All of these at the beginning were financed by T.Y. Lin International. By the head office in San Francisco. Very soon they become independent and finance themselves. And I had no share in any of these. Because I am not interested in money. I am interested in doing work. When I tell them to build and design a new bridge like this Kwang Fu bridge, they can do it. With the main ideas supplied by me.

Swent: Were there ever any times when they differed with you?

Lin: Very seldom. They would make sort of minor changes without consulting me but essentially, the idea came from here, so we work very well. We would build numerous structures. In Singapore, 25 percent of the highrise buildings were engineered by our firm. They now have 150, 200 people. I own no share and get no salary, but I play a very important part. Now when I have to travel over there, they pay all my expenses.

Swent: Of course.

Lin: I have fun doing those things. They all like me very much. So we still have T.Y. Lin Hong Kong, T.Y. Lin Singapore, and T.Y. Lin Taiwan. T.Y. Lin Mexico changed their name now. They're still there; I have no shares.

Swent: That's a very interesting way of doing it.

Lin: No one understands that because my interest is not in making money. I've got enough money to feed myself and I don't care for any money besides that. I want to do interesting work. So everywhere I went, I got new types of bridges done everywhere. The idea mostly came from me. Sometimes from my colleagues. We worked all these things out. So this bridge was built very successfully in Taiwan. The Taiwan chiefs knew me, knew my name, when they heard this T.Y. Lin. Just like Singapore or Hong Kong. Or Malaysia also. They knew my name. Without paying me any royalty or any salary. Yes. They do all the work. But the ideas mostly came from me.

So it's great fun. And they need a name so my name is very well known throughout the world. In fact, there's a funny thing that happened. The new head of the Taiwan T.Y. Lin, T.Y. Lin Taiwan, he was so ambitious, he behind my back set up an office in mainland China, and used the name T.Y. Lin Fukien Company, which is my native province. He got jobs to do, and worked for a year before I found that out. But I told him, "How can you do that?" He said, "Okay. Okay. And it's too late to change." Even now the name has not been changed.

There's a funny inside story. He told some other friend, "I like T.Y., I can work with him; I wouldn't fool him." But he cannot work with Y.C. Yang. Y.C. Yang is tough. See. Eventually, China would be given to Y.C. Yang. And eventually unto him. And he said he cannot wait that long; he wants to grab it now. And he used my name without my permission.

That's the first rebel I've seen. That guy was crazy. All my other friends, "Why you go tell T.Y.?" Then he admitted he did not want that because he can follow T.Y.; he cannot follow Y.C.; Y.C. is much stronger than me. Strength is necessary I think in a way to control the office, but I control the office by ethics, morale, and relations and friends. In the business world, you have to be tough. I'm not the tough type. Y.C. is born that type. So Jim Tai couldn't have stood him. [laughs]

Swent: Is he still running the firm in Fujian?

Lin: Still running this unknown firm and we sort of tried to get rid of this name from him, but the Chinese bureaucracy stood for him.

Swent: Is he still in your office in Taiwan?

Lin: He is. You see, because the Taiwan office does not belong to me any more. I sold it to Dar [Al Handasah], the Jordan firm in London. They own T.Y. Lin International, which owns T.Y. Lin Singapore, and T.Y. Lin Taiwan, but not T.Y. Lin Hong Kong.

Swent: You kept T.Y. Lin Hong Kong.

Lin: Dar failed to get it, so they just remained independent. There's lots of tricks in those things.

Swent: So this person is still in the Taiwan business, and as the Fujian office head, he worked behind your back.

Lin: Yes. He admitted it here but he could not change it now. That's a long story in itself. I felt at peace all the time. Only this guy, Jim Tai, he really annoyed me. He should have told me. He apologized to me, but I said to change the name. He said, "You know I cannot change now."

Anyway, so this first cable-stayed bridge was built and we introduced certain novel features and so forth. For example, the cables were housed in steel tubes, which by the way was Y.C. Yang's idea. Make it stiffer, and more corrosive resistant and so forth.

The Weirton/Steubenville Bridge: Redesign and Technical Controversy

Lin: The more outstanding one is the Weirton Bridge in Weirton, Ohio. Also known as Steubenville Bridge, across the Ohio River. There was also a funny story. It's designed by an American firm, and that firm had no experience in cable-stayed bridges.

Swent: What was the name of the firm?

Lin: I cannot remember. I think it's a big firm. I think it's Baker but I'm not sure. They had a good engineer who left and gave it to a younger engineer who didn't know what a cable-stayed bridge was. So they designed the bridge as if the whole bridge would be supported on stilts, on falsework, or bents. And set up the deck and then put on the cable. Just like my bridge in Taiwan, where I had bents and then put on the girders, but here for the Weirton Bridge, he designed the whole bridge supported on falsework.

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Lin: Now, cable-stayed bridge was invented with the purpose of no falsework.

Swent: Of avoiding falsework.

Lin: He put them on full falsework, like my Kwang Fu Bridge which was a very small one, and which could be easily done that way. But this Ohio River is not a small river. To do that was foolish. And then he designed all the cables and deck according to this scheme. When the contractor got the job, the contractor didn't want to build it that way. This would cost a lot of money. So we worked with the contractors, our two engineers Kwong Cheng and Mark Ketchum of OPAC and I. Eliminated all the falsework and built it up by hanging from both sides of the pier.

Swent: Were you brought in after the job had started?

Lin: After the contractor got the job. He looked at it, and questioned, "How can I build it that way?" So he came to us, then T.Y. Lin International, and said, "Can you design it to be built in the correct manner?" Which we did.

Swent: You had not done the original design?

Lin: No! That was this big firm. I think it's Baker. I'd hate to mention their name.

Swent: They had done the initial design.

Lin: Yes, but totally wrong. Totally wrong. So we redesigned the whole bridge and the contractor built it our way, which was the normal way, with cable-stayed bridge. And it was completed, but during the course of construction, there was a lot of technical controversy. One was the topic of the so-called "composite action", which means the concrete deck and the steel beams act together, and that was new at that time; as of now it's not new any more. When we designed for that, there were all kinds of objections from the highway department of the state of Ohio. So we had a lot of trouble between the contractor and them. We were caught in between. Finally we got those problems all resolved. The contractor made money and they got a good job. But can you imagine, a big firm that used a young engineer who didn't know this thing and designed it in the old way, like our Kwang Fu Bridge, which was okay for Kwang Fu and very economical, but one cannot put up false work over the Ohio River. Anyway, this Ohio River bridge was completed and is still there now.

Ruck-a-Chucky Bridge: Dreamed Out of the Blue

Lin: Now come the real interesting bridge that we designed, the Ruck-a-Chucky Bridge. This cable-stayed bridge was entirely different from anything that existed before. It was dreamed out of the blue and it started the story. It's a long story. The Bureau of Reclamation at Denver were designing and, in fact, building the Auburn Dam near Sacramento, across the American River. The Auburn Dam would dam the water up about 500 feet. And at one place, there's an old Indian bridge, I call it Indian, whether it's Indian or not. But it's down on the river bed. Now the river would be raised 500 feet, and this bridge on top of the 500 feet would become a very long bridge. To go across, they required a span of 1,300 feet. That's a very long span, although by no means the longest cable bridge. So the Bureau asked for proposals, and finally selected four well-known bridge firms, including T.Y. Lin International.

So the four firms were asked to make a proposal each. To go across that dammed-up river, 1300 feet wide with--presumably--a suspension bridge. So the Bureau drew a sketch, a suspension bridge 1300-foot span, across this dammed-up river and hit into the hillsides, straight into the hills with a tunnel at each end. The tunnels would curve out and follow the contour of the hillside on each side. So a very straight bridge requiring two tunnels.

The other three firms sort of followed that idea and made comparable designs. I looked at that site and worked on it for six months; there was a period of lag after they gave out the request for proposal to the time they chose one. So in the six months, I engaged some twelve consultants. From Berkeley, Stanford, to Denver, Illinois, MIT, and and so forth. All top experts worked together. Finally, we worked out a scheme. The scheme was to build a curved bridge. The curved bridge would follow the hillside contour without the tunnels. So I saved two tunnels. Enormous savings, maybe about 50 percent saving, just with this idea.

But how to build this curved bridge? So I started from the beginning with an arch layout, but I cannot curve it! Then I tried a suspension bridge like the Golden Gate, or whatever. I could not curve it! It hit into the hillside and still required two tunnels. Then I tried cable-stayed bridge layout. For six months, I couldn't get a result, until near the end, I got this idea of a curved cable-stayed bridge at this location by hanging the cables from the hillsides. The idea was good but I could not easily do it. So I worked on it upstairs at our own house. I set everything up and tried everything. Finally I got it. I got a solution. I was the leader and the thinking was mine, but all of the other twelve consultants helped in many, many respects--seismic, wind, fire, foundations, structural analysis, and everything. Finally, all the problems were solved.

And finally came the time of interviewing by the Bureau. So, in one week they interviewed these four firms, including my firm.

Swent: Did you go to Denver?

Lin: I went to Denver. I went to Denver loaded with eighty of these slides to explain the proposal.

Swent: Eighty!

Lin: All prepared, every aspect of it. This problem, solved this way, and that problem solved that way! After my presentation for over an hour, the chief interviewer remarked to the two students from the Bureau listening to my presentation, and he told the young fellows, "Now you young fellows know what a professional presentation is." Then we got the job, because it was so well presented, everything prepared. But to be able to do that, I used twelve consultants to deal with all the problems. Either they raised a problem or I raised a problem and they helped solve the problems, you see.

Swent: And it took six months!

Lin: It took six months just to get the idea and all the slides. How to build it, for example. How to build this curved bridge. That's a very interesting problem in itself. See, the bridge is curved. And when the curve--joined together, it is very stable, but before it is joined, halfway, it's not stable. So it requires sidewise cables to hold it in place, three of them on each side to hold them in place. They would be tightened and prestressed or whatever you call it, to hold this curved deck in place. I worked this out by hand in a rough way, but that really needed a computer. Computer really helped and showed how each cable should be tightened, and how much, in order to build this whole thing. All this was presented at the meeting so they were very impressed.

Swent: And the cables were anchored in the hillsides?

Lin: All the cables were anchored in the hillsides. Now, an ordinary cable-stayed bridge would anchor back into the concrete, into the deck. But this, no. They go into the hillside. So that's again also new. But it fits that topography. I think this is a real well-conceived design.

Swent: It's a beautiful one--

Lin: Beautiful. Later, it was awarded by *Progressive Architecture* magazine, which holds one competition every year among bridges and buildings designed by architects and engineers. The next year, 1979, they awarded this to me and I went to New York to receive the award.

Swent: But it was never built.

Lin: Right. Before going into that--the award's citation reads something like: The bridge was designed in a very correct technical way, meeting all the requirements, in harmony with nature, and came out to be a beautiful solution. So we got the first prize, among 923 submissions, mostly buildings, including a few dozen bridges. We were number 1 among all bridges and buildings. That really hit the whole world, and made me known.

Now, okay, the bridge was designed and we made two designs, with the deck in steel first, which we called the orthotropic steel design, and then, the concrete segmental design. Two designs were completely drawn up. I think we must have something like 300 drawings. And they paid us something like two million dollars; the cost of the bridge was estimated, at that time, only fifteen million dollars. The total cost of the bridge was not high, because all we have are cables and plus a deck; there's no pier and no foundation and, of course, no tunnels. Very economical and then we made other comparisons. If you add a pier to it, it would look no good and cost more. So this is the best design, most economical, and looks the best. It's very difficult for me to find another situation like this. But this really got acclaimed throughout the world.

Then to follow this up: the architectural consultants, who was Myron Goldsmith. He's a partner of SOM; you know SOM? Skidmore, Owings, and Merrill.

Swent: Oh, yes.

Lin: Very good person. He worked with me on several other bridges. He was the best engineering architect I know. He studied with Professor Nervi of Italy. He understood engineering and was very good in architecture so he gave me great help. He was consultant on this bridge as well as on other projects. Then he told me, a few years later, he was working with an Indian graduate student, at the Illinois Institute of Technology, in Chicago. He's a professor there and he assigned the following problem to the student and with my help he got it done. If we were to build a curved bridge on a flat area, can you do it? Ruck-a-Chucky was on a hillside, so we can hang it from the hillside. On a flat area, can you do a curved bridge? So, together we worked on this.

Shown by this here. To the left, you see. On the flat area, beautiful, see; I think the beauty is his contribution. The basic theory is mine. This is the theory and the Indian student used this as his thesis. And then the American Concrete Institute published a book of bridges called *Beauty and the Bridge* and this is on the front page. Beauty and the Beast; Beauty and the Bridge. [laughs] And it's beautiful.

Now, this is a theory; again it's not yet built, the bridge is only a thesis. Using two columns or piers on each side, columns placed in such a way and the cables in such a manner that a beautiful bridge is curved. The question is: can it be done? And the result proves it can be done. So, you know, I have two designs of curved bridges.

The Ruck-A-Chucky one goes on two steep slopes. And the flat one with four columns can also be achieved, beautifully. That means we can now go anywhere in between: flat land, slight inclination, more inclination, very inclined; this can be done and that can be done, since the two extremities are solved. So that means I can do a curved bridge anywhere. This I tried to do, occasionally, but I never got that bridge finished anywhere. However, that means if you have a good idea technologically, you can fit into the environment the way you want it. This as I said is published on the front cover for that book entitled, *Beauty and the Bridge*.

This is the kind of thinking which I happen to have and many share with me, like Myron Goldsmith and other professors, they share with me. But not many good engineers are that good, because they were trained only to follow the previous examples. See, engineers always ask, "Has this been done before?" If yes, he can do it, I can do it. But if not, we can always explore. Every idea I have described to you is a new one and can be explored. Unfortunately, the engineering profession does not do much of that.

I think the reason is because the engineering education trends to solve many problems by copying, which is an easy way out. To solve these two curved bridge problems, I had to understand everything: construction, foundation, steel, concrete, analysis, seismic, wind, and so on and so forth and details for connections, and all of that, which not many engineers can do.

Swent: When does this idea come to you? Are you more apt to get it in the morning? Or at night? Is there a time of day that relates to your inspiration?

Lin: Okay. It's very difficult to say. I can say it comes as a snap. Like the Moscone. But actually, it's like eating six pieces of bread; the last one filled your stomach. [laughs] So it's very hard to say, it's not a gradual process. It may come all of a sudden, but it's a gradual process. Take the Ruck-A-Chucky Bridge: we tried so many things there, with all kinds of sketches. And finally came to this conclusion. First it's only an idea and then fit it all out.

Swent: I'm just trying to get an idea of a time or a place; do these ideas come to you more often when you're actually working at your desk?

Lin: I think more asleep. Because often times these things came, I woke up. The Moscone Center, all arches. But it's a long time thinking before arriving at arches. The final arrival may be sudden. But this is really gradual because you had to make it work. Suddenly, got an idea, but how to do it, may take months, weeks, you see. The idea is very interesting. Now we have planted this idea. We show a curved cable-stayed bridge can be done on an inclined hillside or on a plane, anywhere in between. Later on, an engineer could take this theory, "Ah, I can do it;" then he can do it.

The Singapore Air Force Training Institute Bridge

Swent: Has it been done at all?

Lin: Not yet. Now, this curved cable-stayed bridge concept became so well known, my friends in Singapore, and T.Y. Lin Singapore, which again, as I said, I have no shares but they respect me and I like them, one day came to me, "Professor Lin, you have engineered so many high-rise buildings in Singapore but not yet designed a good bridge here." So they will give me one bridge, but to design a high-tech bridge, regardless of cost. So they assigned the Singapore SAFTI, Singapore Air Force Training Institute, which was going to extend from one side of the highway into the other side and needed a bridge to go across. "Can you design this bridge unusual, regardless of money?" Certainly.

So finally we conceived a one column outside the bridge; look at this figure. See, this one column goes outside the bridge and hangs up the whole bridge! See, this is only a 330-foot span. Not 1,300 feet. And that one column is outside and hangs it up! And a curved bridge. It becomes a beauty in Singapore. We spent about half million dollars more, in American dollars. For a total budget of maybe U.S. $3 million. It's now completed and becomes a landmark for Singapore.

Bridging Places Easier than Bridging People

Swent: Very unusual.

Lin: Very unusual. So Lee Kwan Yu received me once. He was the president of Singapore, and the founder of Singapore country. We were talking about how to connect mainland China with Taiwan. He said, "You're a bridge builder. Bridge across anywhere is easy but between two countries that deal with people, it's very difficult." [laughs] He was right. I put the two countries together and had them meet in Singapore. The Mainland China and Taiwan; they met, but as of now, it accomplished nothing. They're still arguing. To cement people is very difficult. I can build this SAFTI bridge. It's new. It's different. But everything is physical, and analytical, sensible, not like people. People change all the time. Aaah! So Lee Kwan Yu was right. Anyway, so I'm very happy about this bridge. It has become a landmark. The reason they wanted this was to show the cadets at the Air Force institute that you can do anything new, even bridges. They wanted to show off high tech at only half a million dollars more. It's fine.

Swent: Tell me more about this meeting between China and Taiwan. You got the people together?

Lin: Oh, yes! Maybe I'll tell you now since you asked. Because I am and was very close to the Chinese leaders and also to Lee Teng Hui, not as close, but I met him many times. Lee Teng Hui is of Taiwan. Lee Kwan Yu is Singapore.

Swent: I'm getting the Lees mixed up. Lee Teng Hui is the head of Taiwan?

Lin: Head of Taiwan, president. Now he actually was trying to separate Taiwan from China, and a very difficult man to deal with. Okay, since I was the pioneer for the Pudong development, so I was very close to Jiang Ze Min and so forth. So about six years ago now, I was in Shanghai, and Wang Dao Han, who took care of the across-the-strait relations, and was previous mayor of Shanghai, he came to my hotel. I asked him, "Do we want to make peace with Taiwan?" He said, "Yes." I said, "How would you like to meet?" Because there was an argument between them. The Mainland wanted to appear as two political parties, and Taiwan wanted to appear as two nations. I asked, "Would you like to insist on the idea of two parties?" He said, "No, doesn't matter, just we meet."

So I had the idea conveyed to Lee Teng Hui. He accepted the idea. They arranged a meeting in Singapore. I did not want to claim that credit, because as I said a long time ago, it may not be a success. And up to now it has not been a success.

So, anyway, I did start it and that's on the record. I call this bridging the countries. So I talk with Lee Kwan Yu about that. "Oh, it's not easy." And he was right.

Swent: Well, I distracted you. So the Singapore Bridge: the column was outside the bridge which was a 300-foot span--

Lin: Just one column, go over 330 feet, a curved bridge with a column outside, shown here. It cost a little bit more than a conventional bridge.

Swent: And that was also a combination of concrete and steel?

Lin: This was all concrete. Except the cables. See, cable bridges are really prestressed concrete. To tighten the cables against the concrete, but put the cables outside; for ordinary beam, the cables are inside. When the bridge gets too long it is cheaper to put cables outside, so it's really a type of prestressed concrete bridge. They call it cable-stayed bridge. It's post-tensioned concrete. So, okay.

We have two other big bridges. I said yesterday, the *World Journal* interviewed me; by the way, I appeared today in *World Journal*, Chinese paper. They interviewed me yesterday; I told them three of my best bridges are yet to be built. One is Ruck-a-Chucky; two, the Peace Bridge, across Bering Strait; three, the Gibraltar Bridge; see, so the paper is going to quote that.

Another question they asked me, "What do you think about the political problems about China and USA and Taiwan?"

I said, All three are paper tigers. They just want to show their strength. No one will dare to fight. Taiwan fight? There is no way they will fight. Taiwan depend on America. America is not going to conquer China. It's too big. USA just can't do that. So America shows strength but can't do anything. China is in good situation now. If they got into a fight, the economy and everything would go down the hill. Why would they do that and hurt the people? So nobody wants to fight, but they want to show strength. They just shout, "I'm ready to fight!" So I called them paper tigers.

The Bering Strait Bridge, Conceived but Not Built

Lin: Now we go to two other bridges, conceived but not built. Very big bridges. The first one is across the Bering Strait. The idea of bridging across the Bering Strait started after my trip to Russia leading the American delegation there in 1958. I came back from Russia. I found the Russian people just like American people or Chinese people; there's no reason why we would start fighting each other. If we build a bridge, we'll have better understanding, communication, and transportation, and so I initiated this bridge. As I mentioned before, Senator Warren Magnuson of Washington was interested in it so he co-sponsored it with me in the paper on how to build this bridge. But what I did contribute was actually making some plans how to build the bridge.

Swent: What is the distance?

Lin: Fifty-two miles. Say fifty miles. Or eighty kilometers. But the beauty is, the bottom is flat, uniformly about fifty meters deep, which is not very deep. See, once upon a time, there was a land, as you well know, going across there. Now it's sunk fifty meters below water. Actually my proposal was maybe the third or the fourth. And many people, engineers, architects, politicians planned that bridge long ago. The Russians planned a dam across. But my plan was to build a bridge because I know a bridge can be very economically built. Now, they are talking about perhaps a tunnel. I think a bridge is much better because it inspires people. You see it. You look at it. Much easier to maintain although it takes effort also. So I proposed a bridge.

Now, I will only talk about the technological part of the bridge. That's my contribution. At that time, I conceived a bridge fifty miles can be built in about 200 segments, 200 spans. Each about 1,200 feet. So I would need to sink 200 piers into the bottom, which is only fifty meters deep. Then I can prefabricate

200 pieces of bridge to put on top of those piers. This is modern technology and it can be done. When I have this plan out people thought it was marvelous.

People who saw my plan think it's marvelous--very good plan. Now, actually, since the thing was proposed some forty years ago, certain bridges have been built similarly. Like my Kwang Du Bridge, we floated whole pieces of steel bridges. And there is this Prince Edward Island Bridge in Canada. Edmonton Island? Anyway. Now there are bridges already built using the same idea--sinking a pier and putting a deck on top. The idea at that time was very new but I couldn't see that this can be done. And now a project comparable to that has already been built. So, the piers are technologically not a difficult problem. I'll prefabricate 200 piers and sink them under water, and put 200 decks on top of the piers. The amount of concrete involved is only a few million cubic meters. And the cost at that time was something like $4 billion. I think now it may be $20 billion or more. But $20 billion is not that much to build a bridge.

Swent: But then there would have to be highways running to the bridge.

Lin: Exactly. The other part is to build a highway or railway or whatever, and that will cost maybe several times more so it's not an easy job in dollars. Anyway, so I conceived the bridge very well; the bridge and its technology is solved, although not designed; we know it can be done. We can compute the amount of concrete, labor, and material needed to do the job. But the main question is the approach road.

Now, this idea caught the imagination of many people. Take the American public: it was published on the front page of *Popular Mechanics* three times in the last forty years. How to build this bridge. We have good pictures showing it. Russia published articles on this. The main purpose was really how to unite the two hemispheres, joining USA or Alaska with Russia or Siberia. But if we have better understanding, we can spend the money, not on war, not on armament, but on communication and transportation. People like that idea, but people are used to fight wars and waste the money.

At the time when I proposed this, the annual budget for armament in the military was about $200 billion every year for either the USA or Russia. At that time $200 billion is enough to build fifty bridges. I think Clinton get this wonderful booming of our economy because there is no war; small wars, yes; there's no big war. All the money that sank into Star Wars and nuclear weapons has been diminished or stopped. And now we have a good economy because the money is used for public benefit. It is much better. But it's not easy.

So anyway, this bridge caught the attention of America and Russia. Even one day I got a call or letter from South Africa. They liked this bridge. I said, it's at the other pole of the earth. But they liked it. Their *Concrete* magazine in South Africa published this article which I have here. A nice article and a beautiful drawing so I had to reproduce it. It again ignited the imagination of all peoples. Why not get together? But to do that of course is not easy.

Receiving the National Medal of Science: Surprising President Reagan

Swent: And this was in the 1970s?

Lin: This bridge was proposed in the 1960s, and this South Africa article was probably in the eighties. And the *Popular Mechanics* in '70, '80, and '90; each decade they published a front page on this. So people are excited over this idea. In 1986, when I received the National Medal of Science at the White House, I presented my pamphlet on this Peace Bridge to President Reagan and here is a picture. He was handing me the medal. I was handing him the Peace Bridge, saying, "Mr. President, I have a proposal. If you build this bridge to Russia--" he was shocked! He really was shocked by me mentioning a bridge to Russia. "You don't need Star Wars. We will understand each other and be at peace." He quickly assembled himself and [makes growling noise]--

But a German photographer down the aisle--there were some fifty photographers--when Reagan and I were on the platform, took a picture and showed it in a Munich, Germany, newspaper. The next day, one of my students in Munich faxed me this picture, with me pointing at President Reagan. And the Germans remarked, "When President Reagan was assembling his top scientific elite to give them the Medal of Science, up came Professor Lin and told him, 'You accept my plan building a bridge across Bering Strait, you don't need no Star Wars.'" He wanted us to help Star Wars. His talk was on Star Wars. I went up, I presented to Reagan the bridge proposal, saying no Star Wars. Germans liked this, because they also wanted peace.

Reagan, I think, by using the Star Wars pressure on Russia, might have helped towards peace. All this race toward nuclear weapons and Star Wars scared the Russians and they perhaps forced them into peace. I was straightforward to build a bridge of peace but he is a player. But if he had broken into a war, humankind would be gone. Fortunately, people are not that foolish.

Swent: What did they call it? Mutual assured destruction.

Lin: Mutually assured destruction. Eventually worked so far. You still never can tell--. Tremendous expense but right now with this stockpile of nuclear weapons, if some mad people got in there? I think it's not possible, but it may.

Swent: We trust it's not so.

Lin: Because Lee Kwan Yu was right, politics is very complicated--

Swent: Yes, engineering is sometimes easier.

Lin: Easier. Much easier. Engineering-wise we do have the capability to build bridges.

Swent: So Reagan was surprised by your offering him the pamphlet.

Lin: Yes. Yes. The German papers said, "Reagan was speechless." That's the word. But actually he was not. He was very clever. In fact, he was shocked the first time; I saw him face to face. He shook. "A bridge in Russia what do you mean?" Then I said, "A physical bridge. It could really go across the Bering Strait." Then he calmed down and treated me very nicely.

Probably all these fifty photographers down the aisle took pictures but that one in Germany published that. Others rushed to me after the ceremony. "Professor Lin, what did you give the president?" And I had another copy in hand. I gave it to the Associated Press, and it went throughout the whole world. I did not intend for publicity. I wanted to influence Reagan. In fact, I think I did influence him a little bit but actually he has made his decision based on whatever. So that made this Peace Bridge known through the whole world, after I gave this to the president.

There's another picture, which the German photographer took, wherein I was pointing to him like one of my students. Because I had no personal purpose in mind. I just say what I want. If it's correct, it's correct.

Swent: Have you had any further communication with President Reagan about the bridge?

Lin: No. No. I notice he did proceed along that line; I'm sure it's not because of me, along that line towards peace. But he's president, he's very smart, so it's hard to say. I did write to Nancy Reagan before that. Nancy had her secretary reply a letter, saying very good idea, so on and so forth. Now, peace has been sort of achieved; there's no need to build the bridge. So if I were to build a bridge now, it must be based on economics.

So I spent quite a time, a few years, researching into the Siberian oil production. Oil and gas. And I found out there's a lot of gas and oil in Siberia. A lot of it in the western portion has been already discovered and piped. In the eastern portion closer to Alaska, not much has been explored, but apparently people think there is a lot of reserves. I did collect some raw data from Russia and had many meetings with our oil companies; they were very enthused but finally ended up nowhere because it cost billions and billions of dollars not only for the bridge but for the pipe or the highway. Someday this will be discovered so I'm glad your library is holding this thing here. In fact much of the material is not in the library, but in the Russian hands.

The Peace Bridge Foundation

Swent: The material that's at the library that I saw dealt more with your foundation; that correspondence about the foundation was there. You established the Peace Bridge Foundation.

Lin: The Peace Bridge Foundation I set up about 1963. And maintained it until now. But now I think there is not much work we can do. I think I must have spent at least half a million dollars on the bridge, through the foundations. Which gave me a tax advantage of course. When I had excess money I contribute towards the Peace Bridge.

Swent: But you still had to spend it.

Lin: Yes. Still there is some money. Now I try to dissolve this foundation in the process. I don't think I can do anything more with it. I try to use it to develop oil of Siberia but this is easier said than done. If anyone ever go along that line, perhaps, you know the oil companies, they could develop the oil and gas. Particularly gas, but you have to transport through pipes to California. In fact, many plans have been made by these people. Once I sat next to Russian Premier of Energy in San Diego at a meeting but nothing happened. You see, to think of something is easy. To do something, much more difficult. Much more difficult.

Swent: Yes. Well, some people find it difficult even to think of something.

Lin: Yes. It's not easy either to think of something. This tied me into the Alaska oil venture which was at its height some thirty, forty years ago. When we laid the Alaskan pipeline--

Swent: This was to Prudhoe Bay?

Lin: Yes! I advocated that we better build a whole entire bridge like this one. [shows picture]

Swent: Oh, this is a combination of rails and--

Lin: --highway and pipe. That would cost, at that time, maybe $5 billion; now maybe $20 billion. Whatever. This is from *Popular Mechanics*.

Very interesting. The one in charge of this Alaska pipeline was a typical engineer. He was set to build the thing; then he had heard of my plans. He got me to visit him and he warned me that I should not ever have create such an idea, which would deviate their thinking from building the planned pipeline. My proposal was too big a venture. I didn't care, and my article was published in *Popular Mechanics*. Next time I met him, he got very angry; he said, "If you didn't do that, I would have given you a job." If I didn't get it published in *Popular Mechanics*, he would have given me a job there, some kind of job, pay me some money. This is typical because these people have so much money; if I get a small job, the design fee may be $10 million, you know, whatever. Which to me would be a lot of money. He thought as an engineer I would love this money. He didn't know I was a different person. I'm not looking for that kind of money. I can't remember his name. The way he said it was funny: "I would have given you a job. You would have been rich." [laughs]

Swent: And he was the person who was in charge.

Lin: In charge of the Alaska pipeline. He did the pipeline. The pipeline is still there, I don't know how good are they. But this is a big scheme. But how can we do that. I said, "We should have the Ching Emperor, who built the Great Wall, build this integrated pipeline." It's not possible. But anyway, it's very interesting.

Swent: Was there a demand for that much transportation?

Lin: Not now. There's not enough people along the route. But sometimes these impulses may not be bad. For example, let's--obviously not true--take Palestine and Israel fighting for a little piece of land. Now there's miles and miles of land in Siberia and with that kind of fight and money you can build a whole city, but nobody would be there. The Palestinians and Israelis would they go there? No. Actually it's much better to spend all this--I'm glad they are solving the problem now, but they have a war, you know, and the money could be used to build a city in Alaska, or Siberia, but it's not for now. That means you have got an integrated plan how to have infrastructure and all. With today's evolution in communication, distance may not be a big problem any more. You know it's very interesting. So this area may be developed but people cannot think that way. They don't think that way. "But I want that piece of land!" Three hundred acres they fought and fought and sacrificed everything. And now Jerusalem; how are they going to divide that up? [laughs] This is crazy! But that's people. That's people! Occasionally it takes people like myself--

Swent: To think outside the box, as they say. To take a larger view.

Lin: Yes. Yes. Okay.

Swent: Of course there's the problem of climate, too. Is that in tundra up there in the Bering Strait?

Lin: My idea is good. But the whole road is full of tundra. How people deal with that, I think we choose certain areas to develop, for now. Eventually the whole area.

Swent: I suppose eventually we'll have to.

Lin: Okay, we have one more project, the Gibraltar.

The Gibraltar Strait Bridge: Taking the Global View

Swent: Go from the cold frozen north to the sunny Mediterranean.

Lin: Yes. Now this is another case, of my taking a global view of a project. It's about ten years ago, maybe a little more; one day Bechtel Corporation approached me. Asked me to help on crossing the Gibraltar Strait.

Swent: Who approached you? Do you remember who approached you?

Lin: I can't remember the name now but one of the Bechtel presidents or vice president. Actually, they got an assignment. The thing started ten years before then when the United Nations set up, allocated some money, and hired a French-British joint venture, two large engineering companies, to study the possibility of bridging across the Strait of Gibraltar. That started about twenty years before now, about. Then, about ten years back, the joint venture submitted a report. The report described how to go across the Strait of Gibraltar: by tunnel, by laying on the riverbed or floating in water, a bridge on top; all different types.

Swent: The tunnel was underneath; what were the others?

Lin: Floating on the bottom, on the rock. And then floating in water, and then above water. I think probably three or four different versions. They completed it in some five years and submitted it to United Nations. The United Nations gave Bechtel the job to review, to study these reports and see how good are these reports.

So Bechtel says, we are qualified to do three or four of these options. But the one, the bridge above water, is not our specialty, but T.Y. Lin's. So he came to me and asked me to be their consultant on the crossing. How to build a bridge. I took their report and looked at it. You see, this is typical. Engineer, engineer. They think within their realm. Along three alternate routes to go across, as shown by the three yellow lines, they chose this corner one.

Swent: This is a map of the Strait of Gibraltar. And one is much longer distance than the others.

Lin: Exactly. One is 42 kilometers, longest; next is 28 kilometers, the one they chosen; the third one is 14 kilometers, I chose.

Swent: Fourteen! That's a big difference.

Lin: Big difference. Now they argued that 42 kilometers is of course too long. They said that 28-kilometer one has only depth of half kilometer water, but the 14-kilometer one has depth of one kilometer which they believed they cannot put any pier on. So they choose the 28-kilometer crossing with maybe twelve spans of 2 kilometers each, et cetera. They span it over like the Golden Gate but with 2 kilometers between each of twelve piers. When I looked at it, I said, "No." The 14-kilometer one is much better. It does have 1-kilometer-deep water but I can jump over that portion, so I put one pier on the shallow 500 meter and jump over the 1,000-meter depth with two 5,000-meter spans.

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Lin: Now, my remark is, these are very good engineers, but they cannot explore beyond the usual possibilities; they don't! They think the maximum span for a suspension bridge was 2 kilometers and the maximum depth it can go is half kilometer. So they chose this 28-kilometer site. After I made a study of the 14-kilometer site, I only need piers 500 meters deep, if I can jump over 5 kilometers! Now the question is, can we do that? After I submitted my report, Bechtel gave it back to the United Nations. And the United Nations held a conference. I think you have it there in the book.

Swent: There was a conference on strait bridges in general.

Lin: No, that's the United Nations internal meeting. But they had a report and I think the report is in there. The report says, "Professor Lin's suggestion for 500-meter-deep piers and jumping over the 1-kilometer-deep water with spans 5 kilometers long should be studied." Can that be done? The 500 meters depth was in the 28-km site anyway. Jump five kilometers. They are stuck with two kilometers. So this study went on, between France, Britain, Spain, Morocco, and myself. They held several meetings.

Swent: Where were these meetings?

Lin: In Morocco and Spain, I think. I went to one in Morocco and so on and so forth. Didn't get any results; people argued. Then, about 1993, I think, I wrote a paper together with Philip Chow and submit it to this International Association for Bridge and Structural Engineering. That's a world-wide number-one bridge association and the paper was published, I think in 1994, and they gave me the "best paper of the year" award, for 1994. After that, there's no more argument, because clearly if this association wants to publish this paper, and select this paper as number one, the idea then must be good enough, so since then, there has been no argument.

Swent: Who is Philip Chow?

Lin: Philip Chow was also a previous chairman of T.Y. Lin International, an old friend of mine. He's a very good engineer and fellow, like Y.C. Yang. Philip Chow is very good in deep foundation construction, so he dreamed up how to build a pier in water, half-kilometer deep. That's his contribution. My contribution is how to span over five kilometers.

Swent: So you worked together.

Lin: Worked together. And on the foundation, he got the idea of segmental construction, similar to what they have done in oil drilling platforms. You build in sections, and put one on top of the other. We made a concept design on this, appearing in that paper.

Swent: You were no longer working in connection with Bechtel?

Lin: No, no, no. After I submitted everything to Bechtel, Bechtel submitted it to the United Nations; United Nations declared it should be studied, but the United Nations did not have money to study.

Swent: Did Bechtel continue to push for the 14-kilometer bridge?

Lin: No, no. They finished their job; they submitted to the United Nations. The United Nations said this should be studied. Then, I went ahead and tried to get a study through Morocco. Morocco has allotted some money; Morocco and Spain had a special commission to study the bridge, so we made a proposal to study its wind resistance. They were to give us half million dollars for the study but then I left my firm.

When I left the firm, the commission says without Professor Lin, we cannot do it. So they stopped it. They took back that contract. In the contract they did stipulate, Professor Lin had to work on the study himself, so the whole study stopped. I think my cost estimate was something like $8 billion. Now maybe $10 or $15 billion.

No one has financed that money. My idea to finance the money was to develop the two ends of this bridge, build two cities. Because I think the importance of the bridge is to join not only the two continents, Africa and Europe, but the two religions, Muslim and Christian, and the people. So that was a great thing to do. But who would pay a few billion dollars? So as of now, the Spanish commission still continues on with their studies and they seem to have no question about my proposal.

Now it's the money. If there is real money, there will be a big discussion to span either five kilometers or two kilometers. But to prove my five kilometers feasibility, the main obstruction is the wind resistance. How would the wind blow on this bridge and maybe wreck it, like the Tacoma Narrows Bridge? So you notice my design is very interesting. I do not think it is the final design but look at this design. It's a combination of cable-stayed with straight cables and curved cable like the Golden Gate. My purpose is to reduce the suspension area length to three kilometers. You look at this, you can see that there's the Golden Gate Bridge for the center three kilometers, flanked by two sides, each one kilometer.

The whole bridge has three peaks, one on each pier. But inside is this one, three kilometers long--

Swent: A little one inside--

Lin: Little one is three kilometers from tip to tip. Now a bridge like that crossing the Strait of Messina in Italy has been tested for three kilometers.

Swent: That's between Italy and Sicily.

Lin: Yes. Has been tested for wind, and found to be okay. So mine is three kilometers. Even without test I can say it should work. But how can it work remains to be studied.

Swent: Is this high enough for ships to go under?

Lin: Oh, yes! More than high enough, like the Golden Gate and higher.

No my idea is for a two-span Gibraltar bridge. One span for going into Mediterranean, and the other span for going out from Mediterranean, so there's no collision. The Golden Gate has one span. This is two spans. Five kilometers in, and five kilometers out. Except a French ship will go in on the right, and a British ship will go on the left. [laughs] Anyway, that's a joke.

So the United Nations liked my proposal because there's two clear channels; the British one has twelve openings, too many. You see, engineers don't look far enough. And they have no idea what technology can do. I can tell even with today's technology and today's material, our 15-kilometer concept works. Now by the time this will be built, maybe thirty years from now, the materials will be stronger.

Swent: You're assuming that they'll get better and better.

Lin: Get better, but I'm designing it without the better material. Even today's material it can be done.

Swent: How could the material get better?

Lin: It's very hard to say. Materials always get better. For example, fiberglass, or higher strength steel. Of course, I don't need any of that but if it gets better we can do it easier.

Swent: You don't think there's a point beyond which it can't get stronger.

Lin: Well, maybe. We are getting there already, so I am designing it with existing material. I don't know if we will go much into that but this design is in your special file on the Gibraltar Strait.

Swent: It's a stack of papers about two feet high.

Lin: Yes. Yes. Something like that. So these I think will be very valuable for the library if someday they come back to that bridge. They will be out of date, but still good for reference.

Now, with this combined cable-stayed and suspension design it can span five kilometers with no problem. A study by our grandson Erik Lin on wind resistance of this design, after his sophomore year at Princeton, under the direction of Dr. Mark Ketchum, showed its critical wind speed comparable to the 3-kilometer Messina Strait Bridge design, indicating it's okay. Now I have not worked out how wide the bridge would be. I think it would be eight or ten lanes including railways, and but that's for later studies.

Now I think the French and Morocco joint commission is still going on, but not doing much work, waiting for money.

Swent: So at the ends, or the sides, I guess you would say, of the strait, the water is not so deep; it's just deep in the middle which can be avoided by 5-kilometer spans.

Lin: Yes. Yes.

Swent: And then there's sort of a shelf perhaps?

Lin: Well, they're all pretty deep, but the depth goes like this. [shows figure]

Swent: Oh, I see, that shows the surface. There's one place that's much deeper and that's what you would jump across.

Lin: Yes. Yes. Jump across. They dared not think that five kilometers would work but now I think, it's pretty well known that it can work. Okay. There is one interesting story about this bridge which I heard from Professor Gerwick. Gerwick said when our paper was chosen as first prize by the selecting jury--

Swent: That's the one that you and Chow did?

Lin: Yes. The commission chose our paper as number one, submitted to the president of the International Bridge Association. Who was a very well-known Danish engineer. He told Gerwick this story. He said, "When I look at the name, I said, 'Why T.Y. Lin, he's my competitor. Why choose him number one?'" Then he read over the paper; he agreed that it's correct to choose it as number one. The paper is very, very well written. Including all the stories and the technology. People don't have time to do that; I did that with great fun.

Swent: Well, it's wonderful to hear you say that this is great fun.

Lin: I think it was great fun.

Swent: For you it really is a joy, isn't it?

Lin: It's a joy, it is a joy. I feel people like Bill Gates, he had a joy in having his firm grow;, he cannot afford to have it shut. So he owned a hundred billion, and he may go on forever. Then if the riches stop, it goes down. But this is business, and therefore money is important to people like him. It's very important. I don't enjoy this kind of thing. I enjoy doing something unusual. Some special bridge. Is it longer or higher or more interesting? Better form, great pleasure in it. You give me $100 billion, I cannot use it. [laughs]

Swent: That's right. There's a limit in how much you can use.

Lin: Okay. I think that's about it.

Swent: I think that's perhaps enough for today. Margaret is back from her dancing.

Lin: Now next time we'll go into Shanghai and then also China politics, Chinese-U.S. relations, but this will be simple.

Swent: Not so simple. [laughs]

Lin: You're right. Tougher. They are really tougher. The Pudong Project. Next time should we go talk about the Pudong Project?

Swent: We could.

Lin: Or San Mateo Bridge, or Bay Bridge.

Swent: We talked a little about San Mateo Bridge last time but maybe not enough. We might talk more--

Lin: All right. We'll see. We can talk about San Mateo Bay Bridge, then we go to Pudong. Yes. Then we go to optimization.

Swent: And your house. That's something we must talk about.

Lin: Oh, yes. Next time we'll talk about our house.

Swent: We've jumped about. We haven't exactly followed our outline. I see that we haven't mentioned Yosemite.

Lin: Oh, that's a small job.

Swent: Is that a little job? Okay.

Lin: If I can dig up the drawings it would be fun. It's a very small job. Total a hundred feet. But beautiful. It fits into the site. Very interesting to show if we have a picture of that. Yes. Emphasize beauty, aesthetics. And there's some high-tech in the design, even only a hundred feet long, but it really looks good.

Kuwait Harbor: Great Success in Prestressed Concrete

[Interview 9: September 21, 1999] ##

Swent: I talked to Ben Gerwick yesterday and he alerted me to the importance of some things that we hadn't talked about. He said that your work on the harbor at Kuwait was extremely important and I thought perhaps you'd like to elaborate more on that today.

Lin: That's very, very interesting and important. It was worked on in the early 1950s when we just started prestressed concrete in the U.S.A. and this project had to do with Gerwick's firm. I think, probably Ben Gerwick, Sr., was in charge, or junior, later, as of now, I cannot remember now. But anyway, both took part. So we were given the job from Gerwick and probably Pomeroy and Gerwick, the firm they were with to design and build a wharf for the kingdom of Kuwait, and they were bold enough to take any new measures we might put in, so together with the Gerwicks we worked out a scheme. It would be entirely precast and prestressed. We were responsible for the design of the deck of the wharf. The floor.

Swent: Yes. And I understand, and maybe you were going to say this, but one of the problems there was because of the chemistry of the water that nothing ever lasted very long there.

Lin: So we thought prestressed concrete and precast would increase the chance of survival.

Swent: Yes. Most things only lasted ten or twelve years.

Lin: But this Kuwait wharf, is over forty years and I have not heard any bad remarks.

Swent: Mr. Gerwick said that it's the only one that is still in perfect condition and has withstood all of the--

Lin: Well, that should be attributed to two things. First, the use of prestressed concrete, secondly, the excellent quality of concrete that was produced. The use of prestressing tightens the concrete and prevents any cracking in this case. So we devised a system where we precast pieces, each forty feet long and eight feet wide. Pretensioned them so that it would be under full compression and with a heavy load from the wharf loadings it should not crack under any conditions. And I did not know but Gerwick mentioned apparently so far it's working very well.

Swent: Yes, and he said it was because of your design.

Lin: Yes, the design was made on that basis. As much corrosive proof as possible using good concrete under permanent compression. It was pretensioned in pieces, something like forty feet long by eight feet wide and they were joined together with post-tensioning. They were tightened twice; first each piece was tightened by prestressing or pretensioning, after it was placed on top of the piles; then we connected them with post-tensioning, further tightening them.

Swent: But this was the first time, I think, that you had done this?

Lin: Oh, yes. Oh, yes! It was the first time, anywhere in fact, where prestressed concrete was applied to a wharf and also to the piles. Now the Gerwick firm worked on all the piles. Later on, I supplied the calculations and tables for the piles. But basically, the Gerwick firm started those.

Swent: And were they also prestressed?

Lin: All piles were also pretensioned. Yes.

Swent: And were they manufactured there?

Lin: Yes, I believe they were.

Swent: I think he said that they were made there under your observation.

Lin: I think that they were made there by Gerwick's company; we just helped to supervise. Which was an easy job.

Swent: But you made sure of the quality.

Lin: Yes, yes. This thing should be more to the credit of Gerwicks but we did initiate the first design of this type.

San Francisco Airport Extension: A Dangerous Plan Considered

Swent: Which I'm sure has been copied widely?

Lin: Not too much! It has been copied not widely, surprisingly. Now I'll give you one example. As of now, the San Francisco airport is being extended and the runways would go into the bay, supposedly to be filled with dirt, and rocks to support the runway. This is a very dangerous way. The loadings they put on, being dumped dirt and rock, will settle over many years. Settle down. It cannot settle immediately. So the runway would be subjected to settling which could be very serious to the runway and also to the environment.

So now they are making a study of this and our vice chairman and chief engineer Mr. Y.C. Yang got the idea that the runway should be built in the bay like the Kuwait wharf, drive piles to support precast pieces, pretensioned and post-tensioned. And when this idea was first given to the airport, they had no idea about this. Then they hired someone to make the comparison and say this is too expensive. But they put on four times the piles otherwise required by us, by Y.C. Yang.

For example, suppose it needs only one thousand piles; they say it will need four thousand piles. So it got very expensive. So we, in fact, together with Gerwick, and other firms made a proposal to study the problem; then they gave the job to a Los Angeles firm who knew nothing about this, but were experts in earth fills. So they are studying the problem now. But I think they will end up in earth fill because they do not know how to do it the right way. That's bureaucracy in America as in all countries! It's terrible. Not only bureaucracy but the engineers do not go for new things easily. This is not new now; has been in Kuwait for some forty years. Of course, a runway is different, but the loads are about as heavy as the runway of this Kuwait wharf. Now, I asked Mr. Y.C. Yang to talk to the airport authorities. He is still doing that; I don't know whether they will use his idea or not. The idea is not mine but I fully support it. Y.C. Yang said, "We apply the Kuwait thing to this here; we can do it!" But the authorities gave it to a firm who has no experience in this kind of thing. Fortunately, in early 2000, they agreed to engage various consultants to study and propose pile-supported runways and other forms of constructing the runways.

Swent: After our experience with the Loma Prieta earthquake with these places that were on fill, they should know.

Lin: Well, even those were not as bad as San Francisco airport runway, that would have been totally on fill.

Swent: Even compacting it, it's still--

Lin: Yes. It will still be fill.

Swent: It would liquify, wouldn't it?

Lin: This may happen. And now they are still supposed to study the comparison but I'm very skeptical of what will come.

One Out of Four Project Applications Succeed: *C'est la Vie*

Lin: At Kuwait, they have a kingdom; the king made the decision and they trusted Gerwick so Gerwick's firm did the job, who trusted us very, very well. But even now, forty years later, we cannot apply it to the new one. *C'est la vie*. Oh, there are many instances like that so if you ask me, do I have failures defined on the basis that I tried to get a job I didn't get, not a structure that collapsed, I think I have many, many. I have tried to get many projects; on the average I succeeded one in four.

One in four. That's after I've got to the job so close, that I have a final chance of competing for it. And I only got one out of four. This is the usual record of the best engineering firms. They only get one out of four.

Swent: You can't get them all.

Lin: You can't get them all.

Swent: And you don't let it bother you?

Lin: No. Professor Scordelis served as a consultant to us. The first time we didn't get a job, he said, "T.Y., are you not bothered?" I said, "If I were bothered, I would have to shed tears three times before I get one." Why? So I just forget about it. He was very impressed by that, being a theoretician, and a professor who does not know the facts of life. The best only get about one out of four. Recently, I worked on the Bay Bridge; my previous firm got it, I didn't get it; I was paid by Caltrans a total of something like $16,000 for my time. And my firm has been paid something like $30 million. But, *c'est la vie*; I lost it. I worked on another one at the U.S.-Canadian border. The Buffalo River Bridge. I went there several times and presented my concepts and so on with Senator Moynihan backing us; still we lost it because local politics was very strong; Senator Moynihan was ready to retire, not as strong now. So we lost it again.

Swent: How did you become friends with Senator Moynihan?

Lin: Well, through Bruno Freschi, Dean of Architecture, New York State College at Buffalo. He knew Moynihan, so he got him to support us and he wrote letters to the papers several times, was a very strong supporter, but still, local people decided using the same old design. That's very typical. So I never worry about those things. There's no end if I tell you the number of jobs that I work on that didn't succeed. *C'est la vie*.

Swent: Yes. Everybody says you're the ultimate optimist.

Lin: Yes. Right. Right. But even I lost three out of four.

Swent: But you don't shed tears over it.

Lin: Not at all. I need to forget about them. So I cannot remember the ones that I have lost. [laughter] Yes. That's my nature.

Buffalo River Bridge: Powerful Authorities Resist Change

Swent: When you went, for example, to Buffalo, what sort of presentation did you do?

Lin: Well, it started by being invited there to give a talk to the College of Engineering and Architecture at New York State University with no idea of working on that bridge. The lecture aroused a lot of interest and many people said we have got to consider this Buffalo River Bridge. So the dean asked me to work with him. So I worked with him from then on as a result of the lecture. Then I went several times more. The newspapers and all the people were 90 percent in favor of our design. But the authorities, who had the power, decided to do it the other way. Number one, save their face. Number two, they have always been reluctant to change.

Swent: This Buffalo Bridge crossed the river?

Lin: It's the Buffalo River, from USA to Canada; the existing bridge is now called Peace Bridge. And they're going to build another one, parallel to this one. So we made a curved design, so beautiful, together with the dean, Freschi. Even with the support of Moynihan, the local people have the power and the vote to steer it the other way. People's voice must have appeared in the papers thirty times in Buffalo. But we still lost. So my effort all spent in vain. *C'est la vie*. And that's life, you know. Okay?

Chief Joseph Dam: A Brilliant Presentation

Swent: You said that you didn't think that Chief Joseph Dam was so important. I talked to Mark Ketchum and the reason he thought that Chief Joseph Dam was important was the brilliance of your presentation. He said that you were such a brilliant speaker, and others have said this, too, that you were a wonderful speaker.

Lin: I think I always did quite well in my presentations because I'm so used to lectures at school for thirty years at Berkeley, and other presentations, other talks and lectures, several hundred of them, so I'm used to these. And also, I apparently have the ability of making very difficult and complicated things very simple and it appeals to the people and perhaps even the politicians. I put it in very clear simple ways so people can understand it.

Swent: Did you use props of any kind?

Lin: Usually I use slides, sometimes drawings, sometimes the blackboard. Yes. Yes.

Swent: Did you plan them in advance?

Lin: Generally, yes. Now, I think I'm unusual in that I can present very difficult things in simple ways. Like Ruck-A-Chucky Bridge, very difficult, if I present the details, people would get overwhelmed, they will not support me. But if I can present the essential features in layman's language, but clearly based on engineering depth and understanding, people like that. I think it's very difficult for anyone to have sold the Ruck-A-Chucky Bridge that looks so unusual; I think my presentation did it.

Now going back to Joseph Dam, that's so long ago. I don't know, thirty some years ago, they wanted to increase the height of the dam, so I said that's natural to tighten the whole dam vertically down to the ground. So I presented a case. I think, later on, they did adopt it without using me. I was not involved in the final strengthening work. So I don't know how Mark knew, but he was at my presentation.

Swent: He was there with you.

Lin: And later on, I believe the idea was used somewhere else by the bureau, another two or three times which I did not follow through. The principles started here, but actually I did it on the back yard of this building, our home.

Vertically Post-Tensioned Retaining Wall at the El Cerrito Home

Swent: Oh, really?

Lin: When you drive in the driveway, to your right is a wall; that wall is a retaining wall vertically post-tensioned, like a dam; it's a dam resisting the slide of the earth. You have this very steep hill trying to slide down and push against the wall, so I tightened the wall with post-tensioned cables. We'll go into the details of that now, okay? See, two things happened. After this was done, my neighbor up the hill flooded his swimming pool; water overflowed all the way down the hill and damaged my retaining wall. Not really on the inside, but his water flowing all over the retaining wall. So we told him to repair it, which would only cost maybe a few thousand dollars. But he would not. He said, "You sue me." See, I should sue him because then the insurance company pays, so I sued him for something like $40,000. That's some twenty years ago.

Swent: He sued you?

Lin: No. I sued him. He asked me to. He wanted me to.

Swent: [laughs] Oh! He wanted you to!

Lin: Yes. Because then the insurance company pays. So we sue him and we won $40,000. And we did not repair the retaining wall. It was not really damaged but we feared it had been damaged. There were leakages through there and rust going through the walls indicating that the steel could have been corroded. But so far it's still there and we got the $40,000. Paid our lawyer 20 and we keep 20. We made $20,000. I asked the lawyer, he said, "Okay, you don't have to repair it."

Swent: You are doing some repair work now on your wall?

Lin: That's another one. That's not post-tensioning; that's just a timber wall.

Swent: And it withstood.

Lin: It withstood. Yes. Well, anyway, we can talk about many projects, there's no end, and some of them I forgot, like the Joseph Dam; I didn't remember that much.

Swent: Mark was so impressed with the brilliance of your presentation at that.

Lin: Well, he may be partial on this. He was my teaching assistant at UC Berkeley. But this effect, generally, depends on the audience; sometimes a presentation can be bad. The rapport between me and the audience, generally, I think is very good.

The I-205 Bridge at Portland, Oregon: Value Engineering Improves the Design

Swent: Did you want to talk about the Oregon I-205 Bridge?

Lin: Yes. That's a very important bridge. That's about twenty years ago now, or twenty-five years ago when the state of Oregon was in charge of letting out the bridge about two kilometers long. And then, the contractor, Guy Atkinson, they got the job. The contract has a clause allowing the contractor to submit value engineering, which is defined as redesigning or improving the bridge design and then sharing the cost savings. So the contractor has a chance to improve the design and get half of the money. See?

Swent: Was there an existing bridge?

Lin: No. No, there is not.

Swent: This was a new bridge?

Lin: New bridge. So the contractor came to us and me. We worked on this bridge and redesigned it. The redesign was easy because the original design was made maybe ten years ago.

Swent: Ten years before that?

Lin: Before that. In ten years, things have progressed a lot, so we use newer technology to improve the design. In fact, not to the full extent but it's as far as we think could be accepted by the state highway department. So we did it. Originally, the bridge had three boxes inside, down here at the deck; which is old-fashioned. We could have used one box but one box will not easily get passed by the highway department, so we agreed to use two boxes and other savings, I think, amounting to $6 million at that time.

Swent: Are these boxes parallel with the bridge?

Lin: Yes. Parallel. The whole bridge is made of these boxes. Two of them. I have many slides to show you how this was done. This is post-tensioned, prestressed concrete, which we worked with the contractor from beginning to the end. We totally redesigned the bridge, using this and other savings, as I said, total $6 million out of maybe $50 million total. But later on there were some minor problems that occurred which I helped resolve.

Later on I heard--our firm was paid something like half million bucks, something like that. They reported it to the highway department, and highway department agreed that they saved only three million, so each of them get one and a half million but I think the contractor got four and a half million. [laughter] That's usually done. I didn't care. But that happens often in practice.

So I know a lot about the contracting firms because I worked with them. To pioneer prestressed concrete or post-tensioned concrete, it's easier to pioneer with the contractors who are under the so-called capitalist system and work on a money basis. You save money, everybody profits. It's a good way! So we can get our value engineering or better economical engineering by working with the contractor. The original firm who designed the bridge originally was an old one and this design was old so we improved it and saved a lot of money.

A Secret About Cracks in the Concrete

Lin: One funny incident: again, I was here at Berkeley still teaching, so that's about thirty years ago, and one day I had a call from the contractor in Oregon, "Professor Lin, we have trouble. We got a crack!" And this was what happened. The bridge was cast in segments, each piece weighing about 250 tons; they were made at a special site, and carried on land to a barge and then on water to the bridge to be lifted up and tightened together.

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Lin: Lift it into place. Two hundred fifty tons apiece and then you join them piece by piece as the bridge cantilevers out. You joined them with post-tensioning cables. Now the first piece, they rolled from the production site several miles to the job site. As they were rolling it, they found a crack in the box. [laughs] A crack! They called me up, "What should we do?" I had to leave immediately from school, either that day or the next morning, to look at the crack.

What happened was: there were two boxes in a segment made up of three webs, as we call them. Web, web, and a web. And the two outside webs of the box cracked, horizontally. Not too much, but it cracked. Because, in order to roll this 250-ton piece, they had a set of rollers, and the rollers only support the box at the outside webs, not the center one. You cannot support three, because you cannot roll three wheels on the road. So we had two parallel wheels, but not three.

But the center web has a tendency, due to gravity, to go down. So I asked them to put on two inclined rods, to pull the center web up. You see here. So they pulled up the center web with these diagonal rods, post-tensioned rods. So I asked them to put on a 1-inch rod on each side. They told me over the phone, a few days ago, they did not have a 1-inch rod but we did have 1.25-inch rods. Bigger. Oh, okay! I forgot to say one other thing. When you pull an inch and quarter rod, do not pull it to the full extent. But they did. They should have pulled the inch and quarter to the force of one-inch rod. I did not warn them and they did not know. They pulled it to the full value, so the whole center web was lifted upward. The box was distorted, so they cracked. When I looked at it I say, "You release that force; shouldn't be that big." So they released it and the cracks all closed. They closed! And during these few hours, the state inspector was not there so he didn't even see the cracks. I think it's still in place on the bridge but not visible.

This is part of engineering, part of decision-making, because prestressing cracks can sometimes close themselves. Of course if it has been cracked, it is more liable to corrosion but it's a very small amount, and even if corrosion did occur it is limited, so it's okay. It's still there on the bridge. And only I know the story.

So I worked with contractors. Also I fully understood the theory, and I also know certain parts of the practice. What you should do, what you should not do. That's why I make good decisions. Sometimes it is cracked, but so what?

Swent: You said each of these boxes was 250 tons. Huge!

Lin: Huge! They are, I think, something like sixty feet wide, twenty feet long. And fifteen feet high. Many details about those things. So I learned a whole lot from the contractors and they learned from me too. I think my success in engineering is because of my understanding of the full theory; I know what is important, what is not important, how much leeway I have and I understand the contractor.

Swent: That relationship with them is very important.

Lin: It's very important to understand them. And they respect me. I told you about this building where the big ring, 400 foot in diameter, and the joint missed by a few inches, but I knew it would not affect anything. But if you don't know, five inches--aaah!

Swent: You have to know what details are critical and which ones are not.

Lin: Exactly! Exactly. You cannot decide that beforehand. This happened in this Columbia River bridge and the big Phoenix coliseum and the Moscone Center, as I told you before. I have never had a real failure.

During the construction, it is the most critical stage.

Swent: This morning in the news, there was a terrible earthquake in Taiwan and of course you're interested in that. Have you heard anything more about that?

Lin: So far, I have not heard any damage done to our bridges or buildings, but you never can tell. 7.6 is very big. The Loma Prieta was 7.1 or something. Yes.

Swent: I think so. You have a lot of buildings and bridges there.

Lin: Lots of buildings and bridges. But I don't think that the bridges will have any serious problems. The buildings I cannot tell. They were not so carefully watched.

Swent: You have to wait and hear.

Lin: So far it's okay.

Swent: Your buildings have stood remarkably well.

Lin: Stood remarkably well.

Lin home and ballroom, built of prestressed concrete.

Lin Family, 1968—Verna, T.Y., Margaret, and Paul.

T.Y., Margaret, and Jiang Ze Min at the Beijing Palace, 1991.

XI NON-TECHNICAL RECOLLECTIONS

A Controversial Building in San Jose, California

Swent: That's an awfully big earthquake.

Lin: Now this leads to that building that we designed that aroused a lot of a controversy, which Gerwick mentioned to you about, I think. That San Jose building; I can't remember the name. Building in San Jose. Thirteen stories or something.

Swent: In San Jose, California?

Lin: Yes. You see, designs were done by engineers; some were good and others not so good. And this one we designed the shaft, the elevator shaft, to resist the earthquake. And somewhere along the line, the engineer made a wrong calculation which did not affect the design but the calculation was wrong. The calculation was wrong!

Now, what happened was, at that time, I pioneered prestressed concrete, there were some engineers who were jealous of that, particularly those who were in favor of either reinforced concrete or steel buildings. Somehow they, behind my back, dug into the building's drawings and calculations and discovered that mistake. Which really had nothing to do with the safety of the building, but it was a mistake. They tried to hurt T.Y. Lin, drag down my name.

Unfortunately, the building drawings were signed by Y.C. Yang so that legally, they cannot blame me. So Mr. Yang was accused behind the back through the State Engineering Registration Committee at Sacramento.

Swent: A state agency?

Lin: State agency! Yes. They accuse this engineer of his design. Of course, we defended ourselves. It took about five years of legal battle; finally they agreed that all right, nothing wrong. But it's terrible and is now behind us. I should not mention the names; the names would hurt people; they are well known names. According to what I know, which is quite probably true, they sue my firm and Mr. Y.C. Yang, who is accused of signing a wrong drawing and tried to get his license away from him. We fought five years and were finally cleared.

Swent: Was the building a state building?

Lin: No. No. It's a private building in San Jose. It's still there. I can't remember the name. But engineers make mistakes. It was a minor mistake, and not important. That was really very bad; it took me five years time, part time of course, to defend Mr. Y.C. Yang against this accusation.

It's a minor error which anybody could have made. Nothing serious. Doesn't change the building design, but there's a whole group of people backed by the so-called Structural Engineers Association; they were against me because they thought my ideas too revolutionary. I still have the file. I didn't give it to the library because this revealed some of the good engineer's names who would be hurt. Not my name but their names. Why should I do that? But I've been in court several times, and most of the time came out all winning.

Litigation and Conciliation

Swent: What were some other times?

Lin: Some other times--I've been accused so many times. Once was a building in Los Angeles. And I designed a retaining wall, like my house. The owner was Mr. Reine. Very rich fellow! He liked his new home to have a driveway supported by a retaining wall of prestressed concrete. He went to city hall; the city office said, "We cannot approve this because this has never been done before." So my rich client sued the city. Sued the city. It took a few months. And finally he had his lawyer to summon the city chief engineer, assistant chief engineer, all of them, to court. The city engineer couldn't afford that much time and went to the mayor and said, "Okay, we'll give him the license." So he got the license.

This was not a suit but threatened by the suit. Therefore money talked and the thing was built and it's still there. And that was the beginning, among the beginnings, of prestressed concrete. People objected, particularly our two cities, San Francisco and Los Angeles. They were loaded with engineers, including my own students. And they were not taught that much. Now if I did something unusual, they would carry the responsibility, so they had to raise questions. But after some of these similar encounters, things quieted down. So then if Professor Lin says it's okay, it's okay. At the beginning, I had to fight for it.

Swent: You really had to fight for it!

Lin: I really had to fight. So people do not know, to pioneer a new type of construction, like prestressed concrete, you have to be willing to go to court and because my father was a supreme court justice and so was Margaret's father, I'm not afraid of this kind of thing. I defended myself reasonably well.

Swent: But you had to spend a lot of time in court then?

Lin: In court, I think maybe seven or eight times. Yes. Most of them in defense of my own designs or other's designs. You know, there was another one, I cannot remember the details. Somewhere in Los Angeles, about eighty years ago, they built some jungles, I don't know what it was, just some lights, you know, which looks like a jungle or a pine tree and the city wanted to tear it down. But local people say it has been there eighty years. So I defended them. It finally went into court and wound up okay. I do this kind of thing. If I think it's right, then I will defend and fight for it.

Swent: But this was not something you had designed.

Lin: No. No. Because I think the city officials are sometimes too timid. And they just exercise their authority. I think that's a problem with me. I like to defy against authorities if I think they are wrong. But now I can only conduct so many things; sometimes I avoid them; heck. [laughs]

Swent: You have to know when to fight and when not to fight.

Lin: Well, sometimes I'd be wrong or be right. So far, I settled one case, didn't lose any. Which is this Emeryville four-story flat, down in Emeryville, near the bridge. So someone sued the builder who was the same builder of my house. Pierce Lathrop. They sued him. You know the way lawyers do? They sue everybody involved in the project. There were twelve or twenty engineers and architects and contractors involved in that building and they were all sued. Finally, the total damage was something like two million dollars. Spread out among all these defendants, everybody got $200,000, so we lost the case. The insurance company paid it--we paid the deductible. I think it was $20,000.

Swent: Did you keep lawyers on your staff at your firm?

Lin: No, we hire. Whenever there's a case, we hire a lawyer. We have some regular lawyers, but also just engineers who know about all those things.

Swent: You didn't have an in-house lawyer for your firm?

Lin: I can't remember. Maybe for a while. We could not afford to hire a regular lawyer; they are paid much more than engineers. [laughs]

Swent: Oh, yes. There must have been cases when you had engineers working for you with whom you differed. Did you ever have occasion to fire engineers?

Lin: No. No. Never. Never. Cannot differ to that extent. Engineering is not 100 percent one way, so if we disagree, we'll sit down and discuss. The correct one will rule. If he is correct we will let him rule, but more often the boss is correct. So why should they disobey the boss? Never had a chance to fire an engineer because he did not obey me.

Swent: You have a reputation as a great mediator, that you were very good at it.

Lin: The reason is I have the ability to understand people as well as techniques involved. When you put that together, I would agree with most people including the opposite side. I would understand them to the point that one of my important colleagues told me once, "T.Y., I tell you, you have a problem. Whoever talks to you last would get your agreement." Because I talk to Mr. A, he says one thing. B says another. C says another. They all seem right to me! Instead of trying to find a difference, I forgot about the earlier one! [laughs]

Swent: Did this ever get you into trouble?

Lin: No. People laugh at me. "Oh, T.Y." After he said that, I examined myself and said "Yes, I understand too well. If I talk with you, to prove my point, I may soon talk from your point of view." That's my strength and weakness.

Swent: There were two other topics that I thought we ought to talk about today. One is your house and one is your health. Did you want to talk about those things?

The El Cerrito House Built of Prestressed Concrete

Lin: Sure. First the house. The house was built at a time when prestressed concrete was only started in the USA. And I liked to build one on this lot which is twice the usual lot. Big size.

Swent: On a quite steep hillside.

Lin: On a very steep hillside.

Swent: With the world's most magnificent view.

Lin: Excellent. You see all the three bridges--Golden Gate, Bay Bridge, Richmond-San Rafael Bridge. So I want to build a place that I can stay for a long time. And I want to build for Margaret a ballroom; she's a dancer. And since we were starting prestressed concrete, I thought we would design this house of prestressed concrete. And we engaged an architect, Claude Oakland, of San Francisco. Claude was the architect of Eichler homes. He was close to us so we engaged him. And the engineering was done by Mr. Y.C. Yang, my colleague for over fifty years now. And all the floors and the roof are prestressed. In addition, the retaining walls are also prestressed vertically.

Swent: Prestressed and post-tensioned?

Lin: Both. Post-tensioning is prestressing. Prestressing is divided into post-tensioning and pretensioning. Our house is all post-tensioning. So the whole building, 5,500 square feet of floor, has no interior columns. It's supported only by the columns and walls on the outside. Because we had a name of designing buildings without columns. So I said, "I will design this with no interior columns, outside yes." You see, there's a column here, and these are regular walls. So we had to span over from wall to wall, using post-tensioned cable buried in the slabs, including that dance floor, which is 25 feet by 40 feet. We used an 8-inch slab; it's very thin for a floor of that proportion. The inside is laced with cables. It has some flexibility, as all floors must have, but you cannot feel it.

Now, not all of my slabs are stressed in two directions, because you only need support in this direction and do not need it in the other direction, so there are no cracks in one direction, because it's compressed but there are shrinkage cracks in the other direction because it is not prestressed. A concrete floor will crack anyway; it looks not as good, but nothing too bad.

Swent: No, it looks fine.

Lin: If you look closely, there are one or two cracks.

Swent: Nobody's going to notice.

Lin: Now, Basalt Rock Company supplied me all the bricks. They are reinforced with steel, not prestressed like the walls. The retaining walls are prestressed but these other walls are reinforced. They should all be quite earthquake resistant. During the Loma Prieta earthquake, Margaret and I were sitting on this chair; the whole building shook but not one crack.

Swent: And the windows? You had no damage?

Lin: No, nothing. Not any kind of damage. Now, I cannot tell, if an 8-scale earthquake occurs on this San Andreas fault, right near by, a thousand feet away, what will happen, but the building certainly will not collapse under any earthquake; it may crack. It may crack under a very serious earthquake.

Swent: Which fault is this?

Lin: I think it's San Andreas.

Swent: That's a thousand feet away?

Lin: I'm not sure which one. But all the professors live along that earthquake zone. [laughs]

Swent: The campus and the stadium and everything is on that fault. Yes.

Lin: Yes. Now, Margaret and I figured out we owed a lot to the university so we then donated our house. Donating cash, we are not that much long in cash, but the building is something that we could donate. And the university allowed us to donate the house but still live in it; we pay the tax and maintain it. So this was donated something like a dozen years ago to the university.

Swent: And this endowed a professorship as well.

Lin: Yes! The university sent a real estate estimator, who valued the house at two-thirds of a million dollars. It requires half a million dollars to donate a professorship. The remaining was reserved for a scholarship fund. But the university doesn't have the money now, so the professorship does not earn any money, but a name, Margaret and T.Y. Lin professor. So, presumably, the university will sell the building when we went to heaven.

Swent: One of your students, Ed Wilson, is the T.Y. Lin Professor. I talked to him.

Lin: Oh, really?

Swent: And he's the one who said he was so proud that he was the first T.Y. Lin professor. He's really proud of that.

Lin: Well, we did develop prestressed concrete only with the university laboratory. I was several years head, director, of the laboratory. The laboratory tests were generally sponsored by the state and others, and we tested in it for the university, on which I learned a great deal and other professors also did. Thus we developed the whole theory, a lot of it anyway, for prestressed concrete design.

Swent: It was possible because of the laboratory facilities.

Lin: Only because of the laboratory, so I said okay, so we presented it to the university. Someone asked later, how about your children? They were very happy. We support them through university. They're okay. Verna and Paul were invited to the chancellor's house in receipt of this building--

Swent: And they don't mind?

Lin: No! They were proud of it too.

Swent: It was a wonderful thing to do.

The Lin Family: Margaret, Paul, and Verna

Swent: Would you like to talk about your health, and your family? You have just been talking about Verna and Paul; maybe you would like to bring your family into the story now. You have mentioned them some but not a lot.

Lin: First of all, I was very lucky to marry a wonderful wife. She's just wonderful! She takes care of me all the way. Over fifty years now. Chancellor Tien Chang-Lin once remarked, "T.Y.'s success in life is largely due to Margaret." And now, my health is not that good, so I am depending a lot more on her. And Verna too. She drives us to San Francisco to UCSF to see doctors and so forth. And Paul. I think Margaret has raised two wonderful children. Paul and Verna. Both have wonderful spouses. One is Lois Wilcox, a Caucasian, and the other, Robert Yee, a fourth generation Chinese American.

Swent: Where does Paul live?

Lin: Palo Alto. Both were graduates of Berkeley. Paul has his master's degree. And Verna graduated here in Dramatic Arts and later at San Francisco State got a credential to teach dance. They were excellent. I think the reason they're good, is because we have a happy life and we set an example so these two all got along very well in their family. Verna's husband Robert Yee is a lawyer, graduated from Hastings School of Law.

Swent: He works with your firm, doesn't he?

Lin: He is a lawyer, but now serving as president of our firm also. Part-time lawyer, part time as our president. So, the two of them have two children, William and Maxim. William is thirteen and Maxim is eleven. And at thirteen, he is 5'11" tall. At eleven, Maxim is about 5'8". Margaret and I couldn't believe this, so we asked Robert how these children grow so tall. He said, jokingly, "Because they get food of different countries. They get the Western food, Chinese food, Siamese food, Thai food. And they enjoy every food. So they all grow up very fast." And now they are steeply interesting in ballet dancing, because Verna is. So Verna takes them to ballet school every day, and she has lessons herself even now.

Swent: And the boys are also interested?

Lin: Oh, yes. The two boys also interested. I'm concerned how they can make a living later on. They're all very good kids. I think it's fortunate we have a good family that is peaceful within. Both their spouses come from good families also. Now Paul married Lois; I ask her what's her origin. She's a mix of French, German, and English.

Swent: Not Chinese?

Lin: She is not Chinese. She's European. She's very understanding. She knows. Somehow she was brought up in a good family. She was able to sustain good old family values, where in modern days, things are quite different. Now their two daughters, Deanna and Katie, were just married. And then their son, Erik, graduated last year from Princeton with a National Science Foundation scholarship, which will enable him to study three years of graduate work. He is now working with Gerwick Company, and soon will attend UC Berkeley.

That's very nice. He first worked with OPAC, with Mark Ketchum for two short summers and learned a great deal. Ketchum says he's very smart. At his sophomore year, I think, Ketchum asked him to analyze our design of the Gibraltar Bridge for wind resistance. He did a wonderful report. Of course not everything was correct, but very good report. He just finished sophomore year from Princeton. He put out a report and I looked at it, I couldn't quite understand it but it was very good. And then his thesis was on wind resistance of bridges. In Princeton. His bachelor's thesis. Now he's working with Gerwick. Hopefully he'll return to school next year.

Swent: He has a scholarship.

Lin: Now, the scholarship allows him to work for two years for actual experience. After he goes back to school, they'll still support him for three years. That's a very good scholarship.

Swent: Oh, that's wonderful!

Lin: I hope he would come back and do it. He doesn't know yet. I asked him what he want to do. He said, "I don't know yet."

Swent: But after two years working in the field, he would be able to take better advantage of his studies, wouldn't he?

Lin: Yes. I think he should go back; he's thinking of going back to Berkeley to study another three years for a doctoral degree; then he may be a teacher. Anyway, to start with.

Swent: That must please you.

Lin: Very smart boy.

Swent: But this one sounds as if he is following in your footsteps.

Lin: Hopefully. Maybe yes. It may change. I ask him, "You decide on bridge engineering?" "No." But he's inclined toward it.

Swent: What does Paul do?

Lin: Paul is an electronic engineer. He worked for some thirty years and now he's on his own. He said finally he got his freedom. He'll do anything he wants. Every morning he get up, he play on the stock market. He doesn't have that much money but still enough to survive by playing on the stock market, using the computer and the Internet; it's great fun to him. He said, "Daddy, I don't want to work as hard as you do. I want to relax." Today, right now, he and Lois are in Paris, for two weeks vacation in Paris. Yes. They like France. They really like it. I think that's a good thing. He always laughs at me. "You don't understand sports. Football or anything else. Only know work."

Swent: But you love your work.

Lin: Yes. Yes.

Swent: What about religion?

Lin: The Chinese, generally, do not have a religion. They say Confucius. Confucius is not a religion; it's a moral teaching. Many of the Chinese are Buddhist or others. To some extent, Margaret's mother believes in Buddhism, but otherwise, we're not religious. We do not look down on religion, but we're not religious. We respect religion, but who is the real god we don't know.

Swent: But you certainly have values anyway.

Lin: Yes. I think, moral values are very important. I learn most moral values when I was very young, under the teaching of Confucius.

Swent: You were speaking of Lois and Paul: values between cultures are much the same, aren't they?

Lin: The two of them are very much the same. Because Paul, although born in China, was raised up in this country since five. He's very American, with some basic understanding of the Chinese morals and values from us.

Swent: Do you think they are very different from European values?

Lin: No! In fact, they are very much the same. If you go into religions they are basically the same, whether you believe in Jesus Christ or Buddhism or whatever. I don't think they have that much difference. People often ask whether the Asian civilization developed without as much religion as the West, and whether that is a disadvantage. I think it's both. Each religion has certain viewpoints and advantages. But often, it's overdone. Look at the wars we have just because of religion. So, religion is fine, but it's not necessarily carried out in the right way.

Swent: The institutions get in the way.

Lin: The Chinese believe in morality but how many of them are real good Confucians? [laughs] Although, at certain times, particularly during and after the Cultural Revolution, the Chinese were corrupt. Now they are gradually regaining, they restored much of it, but still lost some.

Swent: When I was teaching refugees in Chinatown, I was just constantly so amazed and impressed at students of mine who came here not knowing the language, people who had been living at a very high level in China and were washing dishes in Chinatown and have endured things that would have destroyed most people. And yet they have maintained a kind of dignity and self-respect. I was always so impressed, and it must have been something in the Chinese culture.

Lin: Yes. Yes. I think the Chinese culture specializes in patience, the ability to suffer. And one Western teacher told me, in the West, we learn how to use things, how to do things, drive a car, operate an airplane. The Chinese philosophy teach you to get by with nothing. Can you do with nothing? Can you exist with nothing? That's partially Buddhist, partially Chinese, partially the old way when you didn't have so many things. So we learn how to survive without. The ability to endure and suffer, Chinese are on the average better.

You look at the West, say during the French Revolution, before that the people suffered so much. And they were able to stand it. And yet it caused that revolution which really revolutionized Western civilization. I think the West is ahead of China about two hundred years. They had the French Revolution and China is just getting it now. American Revolution, French Revolution. Before that they were about the same as the Chinese. We declare that we learned from the Greek and the Roman Civilizations. And that's two thousand years ago. But actually we've changed a lot only in the last 200 years, say, since the Industrial Revolution.

Swent: The Chinese have a long, long view of things.

Lin: They actually have three or four thousand years of old culture.

Swent: You don't expect everything to happen right now.

Lin: I think I am very fortunate in having learned from both civilizations, not necessarily the best of both, but generally, yes. And they enabled me to encounter all kinds of things. And now, I think China is getting better, but the problems are so huge because it took Europe at least two hundred years since about the French Revolution to now. People in these two hundred years have changed dramatically, in view of science, industrialization, of morality, of organization of government, of freedom, and so forth.

China only started, each time a new leader started, he eventually became the tyrant. Take Chiang Kai-shek, e.g., he started as a revolutionary, and ended up being surrounded by people who were lowly. And after he had achieved something, he cannot catch up with the next one. And then the Japanese invasion dismantled all of the Chinese government. I think China went communist because of the Japanese invasion. At that time, the Japanese declared they wanted to stop Communism by invading China. [laughs] But they actually gave communism the right push to take over China.

The communists when they took China were not that bad. The first few years went very well. But then, Mao Zedong changed into the Cultural Revolution. They will continue the same thing. No leader in China could last long because when you make China jumping from one start to the next, it should be ready for the next and then the next and then on. So Mao Zedong says, "I got to unify China now. I will persist on the revolution." But he didn't know how to jump to market economy or to democracy. And now the communist party tries to look forward, but it's a big problem just to keep moving ahead. Right now they have these one-party congresses. When and how should they develop into multi-party ones? When should they install a real independent judicial system? They were very concerned. And I hope the Chinese will eventually solve their problems.

Swent: Oh, yes.

Lin: But through how many more revolutions, that is the question. I hope the Communist party now should wake up and work out a staged approach toward democracy which I presented to Jiang Ze Min and which I think he's trying his best to carry out, but it's not easy.

Swent: How did you get your contact with Jiang Ze Min?

Lin: Oh yes. That is a long story. That goes into Pudong, Shanghai.

Swent: But you are in close contact with people now in China, aren't you?

Lin: Yes. Yes. It's fabulous. I think I am privileged for having seen both sides. The Asian, and the European and the American. So that I'm able to contribute a lot--if I tell you a story--

Swent: You're in a unique position--

Lin: A unique position and I've carried what I could, but it's very little because I'm just one person. As one person is not a lot.

Swent: You've had great influence. Now let's talk a little bit about your health. You've had a lot of severe challenges to your health.

Lin: Okay. Well, when I was very young, at age maybe under ten, suddenly, I got some kind of a neurotic problem, almost getting mad, and screaming all the time, with very bad dreams. So my parents got all the best of the Western doctors in Beijing to examine me, but they gave up. They said this kid was hopeless.

Then my parents got a Chinese doctor, very good, Dr. Shao, who gave me two doses of Chinese herbs. Completely cured. I couldn't believe it. Later on, Shao's son was in same class with me, and we came to America together, 1931. But that doctor was a very well-known Shao. He gave me two doses and I was cured. I don't know what my sickness was and how it was cured. But it means that Chinese medicine had certain things in it. Although they were not as scientifically based as we are but there must be something in it we don't know yet.

Since then, I was quite all right, but when we came here, about forty years ago, the Kaiser hospital examined me, and the Western doctor then told me, "You're diabetic." I said, "What symptoms do I have?" "No, nothing yet." So, no symptoms, but from then on, I tried to test my sugar content by testing urine, and my health seemed to do okay. Then about ten years ago, the sugar content began to get high so I took pills under a Western doctor, Glucotro, Glucophage, and so forth. But there were no symptoms, so I tried to tell my doctor that perhaps the Chinese did not eat too much sugar and therefore, I survived quite all right.

But now about two years ago, the sugar content increased, so I took more Glucophage and so forth. Then about a year ago, I began to feel weakened. So I went to my brother doctor, T.K., in Los Angeles. He examined me with many doctors, must be ten of them, including possible cancer, et cetera. Everything was all right, except my glucose content. Then the doctors finally said, "You have to take insulin." Because all the pills caused side effects on my stomach, and I cannot eat too well. So the next day, about January first of 1999, I started insulin. That immediately cured my problem. Since them I'm okay, being controlled by insulin.

Swent: Good.

Lin: But to find out how much insulin and what type of insulin I should take, I was referred to this San Francisco UC Doctor Nolte, an expert on diabetes. And she stabilized me on a certain type of insulin with two injections a day, morning and evening. Very good. Now my glucose is very normal, on that schedule.

Swent: Do you inject yourself?

Lin: Yes. Margaret prepares everything and I inject myself. And then, another thing my brother had found out was--oh, go back to the story. About 1986, Margaret and I were ready to go to a cruise in Norway, went to my brother for check; he's been checking me for several years. He found out my heart veins were clogged. He said, "Cancel the trip. We're going to operate on you right now." I said, "Why?" He said, "You go, you'll die there." So I said, "Okay." So he got a doctor in Los Angeles to operate on me. They took this scan of the heart, angiogram, and found out that three main veins to the heart were in trouble. One was completely blocked, one was 90 percent, one was 80 percent.

Swent: Oh my!

Lin: I must be on the verge of death but I didn't know anything. That's the problem. Apparently, I was not sensitive to those things. So, operation changed those three veins.

Swent: From your leg?

Lin: From my leg. That's almost fourteen years now. Now he found out I may have a neck vein here that may be clogged but not too bad.

Swent: Is it the carotid artery?

Lin: Carotid! Yes. So my doctor here sent me to a San Francisco doctor to make a test, so I was tested about three weeks ago and I have an appointment to see that doctor in another month. Apparently the test come out not bad. And my other doctor said, "Never mind because if you operate there's a 3 percent chance of getting a stroke." Why take that chance? No, it's not that bad.

Swent: Your memory is remarkably good.

Lin: Well, yes. So far, it's fine. But now, this technician tested me and she said, "Doesn't matter." So now I wait until the doctor makes the decision to operate or not to operate. I hope not operate.

Swent: Oh, I certainly hope not.

Lin: I don't think I need one. Probably I'm not going to operate.

Swent: I'll have to tell a story that one of my friends told me about you. It must have been a good many years ago that they were on a tour in Europe and they were in Switzerland and had taken one of these funiculars or gondolas up to the top and they got up there and ran into you and Margaret who had hiked up from the bottom.

Lin: Yes! We did!

Swent: They were so impressed to find that you had climbed up the trail on foot. Do you remember that? That you ran into this group of people from here?

Lin: I remember that. Yes. Yes.

Swent: They were surprised that you had hiked up.

Lin: You see, the excess of sugar has damaged my whole body by 1998. It weakened the knees, and now, being on insulin, I'm feeling better. I hope this will all recover. Another part is the age. [laughs]

Swent: You do take a walk, you said, twice a day.

Lin: Oh yes. I exercise a total about one and a half hours a day. All kinds of soft exercise. If I don't exercise I feel tired; if I exercise, good!

Swent: You do something like Tai Chi?

Lin: Not Tai Chi but just exercising. Margaret is very good; she does exercises all the time.

Swent: It keeps you limber.

Lin: Yes. Yes. Very important I have to exercise.

Swent: That's a good idea. Well, you're a wonderful example. That's certain. Yes. Are there other things that we need to be thinking about?

Lin: I think the main thing will be Pudong and the Bay Bridge.

Swent: And have you heard any more from the conference that was in Beijing in your name?

Lin: Yes. That was well carried out. Very, very interesting. So Chinese Premier Zhu Rong Ji gave the orders to arrange it. For a while we slowed down because the rumor was that he might lose his job. And then finally it was decided that he will remain. So Zhu Rong Ji called for one representative from every provincial government in construction and engineering. Another one in planning. So there were about maybe a hundred of them gathering in Beijing, with Y.C. in charge. He gave a talk and I gave a video talk. I think they were quite impressed. We'll see what happens from then on.

Swent: What was Y.C. Yang proposing?

Lin: My topic was creative engineering to help constructing the country. That's my topic. Y.C.'s topic was Value Engineering, to improve design and construction in China.

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Swent: Isn't it extremely difficult in a communist system to get any sort of cost analysis? You really can't, can you?

Lin: Well, China is no longer a communist system. It's almost, almost capitalistic, but not quite there. The whole system has changed. But nonetheless, the people down below have not changed. So it's in between. It's difficult to change.

Swent: Are they able to do real cost analysis?

Lin: Oh, yes, they have. Very much in the American way but there are certain basic differences. But they are people. You can't change the people. But people were brought up in the other system. And that's why Russia has big trouble now. The people--

Swent: And when you are talking about a billion people!

Lin: We'll talk more about China later, but this is big, big problem. Which is very, very interesting. I have general ideas, but the details of this--. Let's finish all the other questions if you have any. And then we'll talk about philosophy later.

Swent: Yes. We've touched on some of these things already. Somebody that I talked to wanted to be sure that you talked enough about your lectures to the architecture students and I believe that we covered that in enough detail but later you might want to add more.

Lin: Yes. That paper, I gave in Beijing last week, I better show that to you.

Swent: Yes. And Ben Gerwick spoke of a very influential four-page pamphlet that you wrote on the use of prestressed concrete in engineering. He said it was a four-page pamphlet on prestressed concrete and it was green. And it was very, very influential because it was both detailed and simple.

Lin: I have several of these, but I don't know which one he has in mind.

Swent: Our dancing girl has come back; we must stop.

Lin: Yes.

Recollections of Early Schooling by Father and Uncle

[Interview 10: October 4, 1999] ##

Swent: This is our tenth interview, isn't it?

Lin: Yes.

Swent: And we're very comfortable with a lovely cup of Dragonwell tea.

Lin: You don't need a cushion?

Swent: Thank you. That's fine. Since we met, I've talked to several people. I talked to Mark Ketchum and I talked to your cousin, T.H. Lin. And we had discussed your early schooling but maybe we haven't emphasized it quite enough. T.H. told me that you had a remarkable memory and that his father was famous for his memory also, and so there seems to be a tradition in your family of good memories. Your father was your teacher; is that correct?

Lin: Yes. Yes, but his father sort of guided us.

Swent: And there was a group of you cousins who all studied together?

Lin: Yes. Yes. His father was very austere. His father. That's my father's brother. I remember once when we were very young, maybe ten years old or less, we were going to the park. He remarked, "What reason going to the park? To smell the scent of the ladies?" We were only ten years old but he didn't like that. Anything near the opposite sex, according to the old days, is not a good thing. He was very austere. For fun, for joke or for real I don't know. But that's the style his father was. Very learned person

Swent: What was your father like?

Lin: My father is a regular judge. He's also austere but not as strict or as austere as his elder brother, T.H.'s father.

Swent: T.H.'s father was older than your father?

Lin: Yes. Yes.

Swent: But you and T.H. were nearly the same age.

Lin: He is one year older. So we grew up together so what he said must be interesting. What important thing that he said?

Swent: He remembered that you had such a remarkable memory. I think you were the youngest of the group that was in this school--not school, but--studying with your father?

Lin: Well, for once, I was. Later there was N.T. Chen, my cousin here, who's not in good health; don't talk about it. His wife, just declared to have had cancer in the intestines. Pretty bad. Anyway, he was still one year younger than me but he didn't join us until later. And he told me the same thing. "T.Y., you have very good memory in memorizing Chinese classics and poems." My father teaching us, asked us to memorize and next time we meet, in a week or two days or whatever. Apparently they said I had very good memory; I memorized very well.

Training in Memorizing and also Creative Political Thinking

Swent: What were the classics that you learned?

Lin: Well actually, the Chinese four books and five classics, the Great Learning, Doctrine of the Mean, Works of Mencius, Book of Change, the Book of Poems, and so forth.

Swent: Is this what's called the Analects of Confucius?

Lin: Analects, another one. We also of course memorized the analects. I still have copies of this right here.

Swent: On your coffee table.

Lin: I read it over, yesterday. Much of it I still couldn't understand. I don't think I did when I was young. But memorized it. So we were trained.

Swent: Did your father teach you to read and write also?

Lin: Oh, yes. Read and write, but copy the classics or the analects and later on, when I was around ten or eleven years old, I was asked to write essays by my father.

Swent: And this was creative?

Lin: Creative. Creative. Yes. Or generally about politics, history, and human behavior.

Swent: Would he assign you the topic?

Lin: Yes. One topic was very interesting: the central part of China, around Shang Tung province, away from Beijing, is a city called Xuzhou. It's a junction of the railway from Beijing to Shanghai at about midpoint with another railway going east and west from Shang Tung to San Shi. So he gave me a topic: "Since ancient times, Xuzhou has been the center of warfare within the country; why?" I wrote an essay on that when I was about ten.

Swent: Oh, my goodness!

Lin: I couldn't understand it! Looked up the books and everything. Couldn't get any idea, so he gave some instruction and backup and I did write the essay, but whether it's worth anything or not, who knows? [laughs]

Swent: Do you remember what conclusion you reached?

Lin: I cannot remember. It was written not so well, but still it was written. Every few weeks we were given a topic to write on. So that gave me excellent training on future thinking about China, world, nations, and peoples.

Swent: That seems like a remarkable question to ask a ten-year-old, doesn't it?

Lin: Yes. Yes. But at that time, I had already memorized much of the five classics, and read some of the history of China. Of course, still not enough.

Swent: Well, you could spend your whole life reading the history of China. [laughter]

Lin: Yes. Yes. And, by the way, I think the biggest war between the Communist party and the Nationalists was also centered in Xuzhou. So this is the center of the crossroads. So get this city and then you can go in any direction.

Swent: Is there a lake there?

Lin: There may be a small lake.

Swent: West Lake?

Lin: No. West Lake is further down near Shanghai. This one is closer to Beijing. The crossroad between Beijing to Shanghai, and Shang Tung to Shang Shi.

Swent: I remember being in Xuzhou one time. Very pretty old city.

Lin: Yes. All kinds of wars were centered there. You won that war, you got all of China. That's the key point. Yes.

Swent: You were thinking along political lines very early.

Lin: Very early, and that's why we are going back into political thoughts which we will discuss after Shanghai and Pudong.

XII THE PUDONG PROJECT

Friendship with Chinese Leaders

Swent: So perhaps we should begin on Pudong, Shanghai. How did you come to be friendly with the leaders of China?

Lin: That's a very interesting story. By design and by chance. Both. When Nixon recognized China, the Chinese officials came to San Francisco and visited us. Nixon recognized China in 1973 and then they came 1977.

Swent: Early 1979 is when Deng Xiao Ping came to the U.S.

Lin: Yes. Before that, the mayor, the first mayor of Shanghai, led a delegation and they visited our home, right here, where you are. And in this here we entertained them. And we ordered food from King Jing Restaurant. So we discussed all that. Anyway, I was in touch--

Swent: What did you talk about?

Lin: At that time, I imagine, rather general things, maybe about China, about USA.

Swent: Did you talk about bridges at all?

Lin: No! Oh, by the way, yes. Because I showed to one of the mayor's subordinates a pamphlet which I published with my T.Y. Lin International. The front page showed a cable-stayed bridge built in Taiwan. And that bridge was named Kwang Fu Bridge. Kwang Fu mean "recovery".

His subordinate, clearly a devoted Communist, was unhappy. "How can you call it Kwang Fu? Are you trying to recover mainland China by the Taiwan group? You built this bridge in Taiwan, call it Kwang Fu, to recover all of China?"

I said, no! The intention was the recovery of Taiwan from the Japanese! [laughs] That's how it was named. In any case, it was not named by me. The government named it. But I think the government had no intention at that time of recovering the mainland, take the whole thing back. They were talking about the Nationalists recovering Taiwan from the Japanese occupation. But anyway, his subordinate was unhappy and almost sort of listed me as an anti-Communist. And I didn't mind about that because I told you, some twenty years ago, I was labeled as pro-Communist by the Taiwan government and called a "Lin Bandit". Very serious case. I think I did mention.

Swent: You did mention that but I don't think you mentioned Lin Bandit. [laughs]

Lin: Yes. Anyway, UC President Clark Kerr and Professor Zhou Yong Ren sort of helped clarify the situation later. That's taken care of. And now I'm being labeled as pro-Nationalist. Okay. I didn't care for that either. Well, that started our relationship. But the mayor of course was more knowledgeable. Didn't worry about this name of a bridge.

At that time I began to think about building a bridge in Shanghai across the Hwang Pu River. The Hwang Pu River flows directly into the Yangtze, near the mouth of the Yangtze River. Very important one in Shanghai. When I was very young, I had a thought of building a bridge across it. Just an idea.

Bridging the Hwang Pu River: The Technical Challenge of Access

Swent: There had been no bridge?

Lin: No bridge. Now: why no bridge? Because the Yangtze River goes all the way down and no one was able to build a bridge across the Yangtze. Now this is a branch at the very mouth of the Yangtze crossing Shanghai and no one could build a bridge across that either. The bridge would not be as long as one across Yangtze, or maybe half as long, but no one would dare build a bridge. Now why the other countries, European countries--France, Britain, Germany, and what else, occupied concessions in Shanghai. The heart of Shanghai belonged to the concessions. And the heart of Shanghai and the concessions borders along the Hwang Pu River. Beautiful river, dirty water, but nonetheless, they bordered that. They took all the land to the north of that river, up to the Yangtze River. And the foreigners occupied that area. [shows map]

Swent: This shows the initial stages.

Lin: Before anything was done.

Swent: Yangtze comes down to here and this is the Hwang Pu.

Lin: Right. Right.

Swent: A very wide river there.

Lin: Yes. Yes. Yes, and the concessions were here. So the foreigners wouldn't take the money to build the bridge across either. But even if they had, they don't want to build a bridge, because across the river is not a part of the concession. So Shanghai remained developed to the west of the Hwang Pu River, but nothing crossing the river. And when I was young, I thought about building a bridge. And that was reinforced by studying at Berkeley and learning bridges and going back to China via Europe. So I visited every major city, Chicago, New York, London, Berlin, Paris, and took boat back to Shanghai. I think I told part of that story.

Swent: Yes, you did.

Lin: I was impressed. Every big city or capital had many bridges because most of the cities were built along rivers and they always crossed the river to develop the land. And they knew how to build bridges. But the Chinese did not learn to build such big bridges. We have many small ones. And foreigners that occupied Shanghai had no intention of building this bridge.

So the so-called Pudong was a land of warehouses. Very ugly, undeveloped. But just across the river to the west, here, are the concessions which were beautifully developed with highrises, say twenty stories high, or whatever, you see. And I thought we should build a bridge and develop over it. I didn't think of developing Pudong, just thought of building bridges. And yes, in a way to inhabit that area.

Swent: I see that the airport is there also.

Lin: Now, this is my proposed airport site. It’s built up now as a big airport.

Swent: But at that time there was no--

Lin: This is a very preliminary plan.

Swent: I'm trying to think what it was in 1978 or so when you were talking about it.

Lin: All this area was just land and warehouses and farmer's lands, farms.

Swent: The goods from the warehouses were taken to Shanghai by barge or boat?

Lin: You see, warehouses were across the river from Shanghai, and the ships are here.

Swent: So the warehouses were to serve the ships in the river.

Lin: Serve the ships. Serve the river.

Swent: They didn't take goods across the river?

Lin: No; well, maybe some goods were taken across by barges. This has been going on for, I don't know, sixty years or whatever during the time of the concession. And I wanted to build a bridge so when I saw this mayor here, I mentioned this and after that, I began to prepare a set of plans on how to build a bridge. Of which I believe you have a copy in the library. But if not, I may have one here. Or two even.

So, since then, until 1980, I worked out a set of plans. How to build across the Hwang Pu River with modern technology. Here are two slides: one is my sketch, one is as built. This is my sketch, 1980. Shanghai is a very heavily inhabited area on one side of the Hwang Pu River, nothing on the other. Now how can you climb up to the river to allow passenger ships going underneath the bridge? Ships are reasonably tall, 100 feet whatever, and your bridge will have to rise on the land, uphill over the river and then down. It will have to go back two or three kilometers. Then we will destroy all the houses before it get to the bridge, so I proposed make a round circle. So this is my picture. You should have it, if you can get that book.

Swent: Oh, I see. It's a spiral onramp that goes up in a short distance.

Lin: And the next picture shows as built.

Swent: As built. Very similar.

Lin: Very similar; I gave this whole book, maybe ten, twenty pages, showing how to do it, and the bridge itself. The bridge itself, I had four proposals. And I recommended the cable-stayed type.

See. Arches, semi-arches, and girders, and so forth. And that was adopted.

Swent: The cable-stayed?

Lin: The cable-stayed later on was adopted, but at that time, 1980, we made a drawing with the help of my staff and presented it to the Shanghai government in 1980. I said, I suggest we build this bridge; my approach, my thinking, was all technical.

Swent: Did you go to Shanghai to present this?

Lin: Let me think. Not this time. In 1985, later. But the bridge pamphlet was submitted in 1980. I didn't go myself. The government shelved my plans because they had no money, and secondly, they asked themselves, Why go to Pudong? They had no idea of developing the entire Pudong.

And there were the foreign concessions in Shanghai built for the foreigners. Why should we build a bridge to Pudong which was bare land, farming and warehouses. They had no idea that you could develop the land. But neither was I thinking too hard about it, although I knew you could develop the land; that's the purpose of the bridge, but I was so technical that I concentrated on what would happen at the two ends of the bridge. The whole idea was kept dormant for five years until 1985. It was October, when Wang Dao Han, the then-mayor of Shanghai, just retiring from his mayorship in 1985, visited us San Francisco.

Convincing Jiang Ze Min, Mayor of Shanghai, to Build the Bridge

Lin: And the job was just handed from him to the next mayor, Jiang Ze Min. That's 1985. So Wang came, and stayed at the Sheraton, Fisherman Wharf, which is one block from my office. So I volunteered myself and went across the street, knocked on the door of the Sheraton, Fisherman Wharf. He was just getting out of his room and walking from his room to a meeting hall. They were having a meeting of some forty people.

I caught him from out of his room, walking along the corridor to the meeting room. En route, I asked him, "I presented to you the scheme for bridging the Hwang Pu River and apparently you don't have money to build it. Now I suggest that I will get the money for you so you don't have to pay money but after you get the bridge built, the land will increase in cost by a hundred times. You can easily sell a small piece of land and pay all the cost of that bridge and if you would sell the rest of the land, the city would be very rich."

In fact, just a few weeks ago [before that], I had been discussing with Dr. Albert Akl. He was developing for the prince of Saudi Arabia a piece of land along the Silicon Valley. I was awakened by his idea and I said we should do the same thing in Shanghai. So I suggested the mayor to build the bridge, increasing the value of the land, then sell some of the land to pay for the bridge, and the rest will be income for the city or the country. That one sentence woke him up. He said, "Professor Lin, you are right. You work with me and we will never forget you." That started me going. That's 1985.

Swent: They just didn't have the capitalist kind of thinking; is that it?

Lin: A lot of story behind that. Now comes the point. He likes the idea but he, later on, disclosed to me the problems he encountered. This short walk lasted only a couple of minutes. He had to solve several problems, although it was clear to him at that time and also to me that was the direction to go. He said, "You go with me." So he invited me to Shanghai the next year and he paid all of my expenses and Margaret's. First-class flight, first-class hotel, but I would not accept any honorarium. This idea was to be my contribution to Shanghai and China. Meanwhile, after that short talk, he took my idea and I accepted his, "I will continue working with you." So after he went back to Shanghai, we had a lot of correspondence on how to do this.

Swent: How was this correspondence conducted?

Lin: Just by letter.

Swent: In Chinese, of course?

Lin: In Chinese. I think I had some of these letters in your possession there.

Swent: I know there's a box with a lot of Chinese documents in it which I couldn't read, of course.

Lin: Yes. Yes. But they did not write that often. Now, how did I conduct it? Telephone sometimes. Telephone and letters.

Swent: This was before faxes.

Lin: Yes. But then, two questions were developed which was clarified when I went to Shanghai, the first time. In '86, I went at his invitation as an honored guest, had meetings and presented my views. Oh, yes! I wrote reports on the plans for the development of Pudong for Shanghai. Seven reports. Total maybe that thick.

Swent: A couple of inches thick!

Lin: Yes. These were all political discussions, not engineering talks, including brief sketches. Then when I went there, and discussed before the city of Shanghai, number one is why, and then how? And so forth.

##

Lin: So we had several meetings between myself and Jiang Ze Min's staff of Shanghai City. At first, we got very negative response from the Shanghai people. All questions, "Why not develop Pu-Si, Shanghai itself?" One reason being, people would like to live here in Shanghai. They say a whole house, for people to move over, to Pudong, is worth less than one room in Shanghai. And other reasons. Pu-Si is all well developed; keep developing the concessions which had been taken back by China. Forget about this dirty farmland and warehouse, et cetera.

And then two basic questions were asked. Is this the right thing to do considering the Communist basic theory of not letting the land be sold or leased to the people? And also, if we do lease it to foreigners, would that become another concession? These were the two main questions, plus the fact that people might not move over there.

So Wang Dao Han told me, very interesting, he said, "We communists, when you have a controversial issue, we open it up for discussion first." It's really like in America; we didn't think that Communism was so very democratic. Open up for both sides to present the views at several meetings. And then we turned out the cost with the leaders, to decide which way we want to go. To do or not to do. To be or not to be. Then, we channel the discussions to the left or right direction. You see, and at a certain time, the situation would be clarified. "Yes, go!" Now, we here, we didn't think that the Communists will progress the same way we do our business.

Swent: Consensus?

Lin: Consensus. Want to create this consensus by open discussion. Emphasizing the negative, as well as the positive. We had a big group discussion, afterwards. So this was the first session we had in Shanghai. I prepared many slides to present my point of view, of why to develop Pudong.

The first sessions were positive and negative. I believe this was 1986. Then the next year, I was invited again, 1987. Same conditions. First-class air flights for me and Margaret. First-class hotel and treatment. Accept no money. So the next year we went there again. The thing was much better arranged; they tried to channel into the direction of developing Pudong, which the people didn't like. And Wang said, "Now, I'll bring you to see the premier." Who was then Zhao Zi Yang. He was later kicked out as a result of the Tien An Men affair. He was a very good secretary general with modern thinking.

But he ran into conflict with people who were much more conservative and the struggle between the progressive and the conservative continued for almost a year. So, in the next year, they had it all arranged. We went to Shanghai again.

Swent: This is the third time?

Lin: Maybe the second time. And Wang Dao Han told me two things: first, "I like you to see Deng Xiao Ping but not possible. So please write a letter to Deng Xiao Ping under your name advocating the development of Pudong." Which I did write and he took through Jiang Ze Min to Deng Xiao Ping. But he arranged with me, instead of meeting with Deng Xiao Ping, a meeting with Zhao Zi Yang, the premier. Deng Xiao Ping was the man behind the throne, but Zhao Zi Yang was the premier in charge. So he brought me to the People's Hall, Great Hall at Tien An Men Square to meet with Zhao Zi Yang.

Zhao Zi Yang Questions Leasing of Land

Lin: Presenting to him my idea of why and how to develop Pudong. So I waited a few minutes in the hall; he came out, started discussing. He said, "Professor Lin, there are two problems. One is, people will say, if we lease the land to foreigners, are we not repeating the concession?" I can take care of that. That's no problem. I can explain to them. We are not conceding this land to the foreigners, but leasing it to them and it would be under our control. That can be easily done.

Swent: I'm a little confused. Why would you be leasing the land to foreigners? You were proposing to lease the land? You?

Lin: Yes. My proposal was to sell or lease, but the idea to sell didn't go through. To lease the land to all foreigners and

Chinese. So the land price will go up. You get all this money to build the bridge and everything else.

T.Y. Lin Proves His Integrity by Refusing a Gift

Swent: Were you proposing to acquire a lease yourself on the land? For your firm?

Lin: No! No, no! Absolutely not! That's very interesting. I never thought of leasing the land myself.

Swent: T.Y. Lin International was not going to acquire--

Lin: No, not at all. No. Not the firm, not myself, but to all others I simply advocated the idea. In fact, later on, maybe 1992, we were in Shanghai again, because since then, we went there once every year at their expense. This time we were staying at the Jing Jiang Hotel. The same hotel, always there.

Came in Wang Dao Han. And he offered me, "T.Y., you did such a good job; Pudong will be developed. We will give you a piece of land at a nominal price." I did not say anything. I did not accept it. And that really impressed him. And he conveyed that to all the Central Politbureau that T.Y. was not working to get a piece of land for himself. He is thinking for the whole country. I stick to this approach from beginning to end. Now, going back to Zhao Zi Yang.

Swent: He was still afraid that this involved leasing land to foreigners?

Lin: This was Zhao Zi Yang. That's 1987 at the People's Hall. But he said, "I can explain that to the people." He felt he can make that clear. We are not giving our land like concessions; we're leasing the land to the foreigners. See. But the second question was a more difficult one, since the constitution says that the land belongs to the nation.

The Constitution is Amended to Allow Leasing Land for the Bridge

Swent: It was against the communist theory; was that it?

Lin: Yes. The land belongs to the government. This should be resolved by an amendment to the constitution. And the next year, '88, the constitution was amended to allow, private, not ownership, leasing. To allow leasing people with a land for a hundred years. Or whatever. To foreigners and to the people.

So this is recorded in history as the first amendment to the constitution, allowing land to be leased. In fact that started before I met with Zhao Zi Yang. Wang Dao Han told me this would be a main obstacle but we can do it. So he and Jiang Ze Min with Zhao Zi Yang proposed this to the People's Republic Assembly and got it approved. I have a copy here, showing it being incorporated, 1988.

Swent: This was a tremendous change, wasn't it?

Lin: Tremendous! Tremendous! It's surprising because the people liked the change, Wang Dao Han, Jiang Ze Min, and Zhao Zi Yang, plus Deng Xiao Ping, who was the critical person; they all want to change in their heart. But no one dared to initiate this, because there were also conservative members. If you do something like that, that's against basic communism; kick you out of the party. [laughs] Could happen. They want me to do it. I'm not a party member, you see. Let me do it. So I did it. I made the suggestion. But they proposed it; the idea originated from T.Y. Lin. They got protected.

Swent: They were protected because it was your idea.

Lin: Right. Right. And this is why Wang Dao Han told me at the Sheraton Hotel, "You work with us and we will never forget you." Why he needed me? He needed me as a figure, an important figurehead. T.Y. Lin, famous engineer, professor, and a Chinese American, outside the country. He said this. Now, let's see whether he is right. See, he's very clever. But the most difficult thing is to get Deng Xiao Ping's support. Apparently they had this from Deng Xiao Ping, without a written approval. Deng Xiao Ping took this position. He wanted to change the constitution, modify communism, but he also wanted to proceed carefully; he didn't say so, but the people knew that he wanted this way.

During the days of June 4th, 1989, Tien An Men incident, two days before the riot, I saw on TV here, Zhao Zi Yang and Li Peng appearing with the Chinese students and the news media, two on opposite sides. Zhao Ji Yang wanted to understand the students and Li Peng against them. And finally, Deng Xiao Ping had to make a decision. And Zhao Zi Yang was kicked out. In fact they massacred the people, based on Deng Xiao Ping's decision. It's a very tough decision, which could have been done much better, but it was done from Deng Xiao Ping's then point of view; he was surrounded more by Li Peng than by Zhao Zi Yang. There were other people too. Pros and cons. Because of basic difference in conservative and progressive approach. I think Deng Xiao Ping had a very difficult decision to gun down the students. He did so as a show of their insistence on the so-called communist theory, and to direct along a tough approach. That's my thinking.

So Deng Xiao Ping had to maintain the support of the army and to show the people he could play tough. So Li Peng won and Zhao Zi Yang out. You see, this kind of things, Americans don't understand. The order was executed in a very bad massacre, but they had no choice. Even today, a few months ago, Jiang Ze Min declared, "If we didn't have that massacre, which was bad, we wouldn't have today. We had to maintain order." It's like a revolution. Heck with a thousand people killed. We're talking millions, billions of people. Americans don't understand that. It's a very bad thing, but there's no other choice. They might not have water hoses ready. Anyway, we're talking about Zhao Zi Yang; let's go back on that.

Swent: But this had its effect, because having made this strong statement, then they could be more flexible about your Pudong development.

Lin: What statement?

Swent: I mean the Tien An Men incident got the army very strongly behind them.

Lin: Oh, yes. Yes, yes. Exactly.

Maintaining Party Control: Similar in China and Louisiana

Swent: So then they could be a little weaker on something else.

Lin: Well, it's not because of my idea, but basically they have got this problem. Deng Xiao Ping has to keep the army strength and to control the army. They use party members to control the army. Every army general is followed by a party member, to be sure his political thinking is right. And through these party members they understood the workings of the generals. Deng Xiao Ping controlled the army chiefs as well as through the political members. Do you know we have similar things here, in Louisiana. When I tried to get a job in Louisiana, it's a more corrupt state.

Swent: Was this when Huey Long was there?

Lin: No. It was after that. I can't remember. But the government were corrupt and they were controlled by party members. Democratic party at that time. But here, we only have one or two Louisianas.

Swent: But you tried to get a job in Louisiana?

Lin: Yes. We knew the situation but we couldn't do anything. But we knew that you would get the job if you would pay; we never paid and we were not directly told, but it was made clear to us. But in China, every general has a political counterpart who would watch the general. Now, where were we now?

Lin: We're still in People's Hall with--

Swent: With Zhao Zi Yang--

Lin: Yes. But clearly, Zhao indicated to me there were obstacles for him to overcome, for Zhao Zi Yang to overcome.

Swent: So these are strictly political obstacles?

Lin: Very political. Very difficult.

Swent: Not technical.

Lin: Not technical. But they understood me; it was because I understood the political part, and they knew I understood it. So we finished the conversation and he said he would handle that. So we came out of the hall.

After that, Wang Dao Han accompanied me and I got out of the hall just a few steps; someone rushed from the hall outside and called Wang Dao Han back. Say, "Premier Zhao want to talk to you." So he was called in without my being there. He went in. And after a few minutes he came out. He said, "Premier Zhao asked me to discuss these things with certain people." But I think they were members of the opposite group, to get their consent.

Anyhow, they had to play between two sides. Right now, Zhu Rong Ji is assaulted by many people from the conservative side. A few months ago, he was in deep trouble from what I heard. But Jiang Ze Min will sustain him. So in fact, I wrote to Jiang Ze Min, asking him to sustain Zhu. He did, but whether my letter had any effect, I don't know.

October 1st; I got the paper here. Front page. Zhu Rong Ji. If this had been otherwise, Li Peng would have been there. So Jiang Ze Min is plagued between this. You see, and he got the army. The army people were more pro-Li Peng but they respect Jiang Ze Min. Jiang Ze Min would not like to offend Li Peng, so he may offend the army or the Li Peng group or the conservative group.

And this is still going on, somewhat like the USA. When we have a Republican group, sometimes they think of the country, sometimes they think of the party. So that goes on all the time. Jiang Ze Min, meanwhile, want to maintain a party control. But the party is split in two like us. We can split quite easily because we have a constitution and we have a third party, the judicial one, which sort of mediates between the two. But Chinese don't have, so Jiang Ze Min has to play that part. He has to mediate between them. So on and so forth. These inside stories, some good American scholars in the State Department understand it.

Swent: Who are the ones that you think understand the most?

Lin: I don't know the name but the entire State Department, they have studied China and I have some letters from them indicating that they understood. It's not the person; I think the whole State Department knows China and they help to keep this in balance. So Clinton had the advice of this State Department. I think Congress should never make foreign affairs a point of struggle between the two parties. But recently this often happened. This is very foolish. But, *c'est la vie*.

But anyway, go back to Pudong situation. Wang Dao Han got out of the hall and told me that he had spoken to these other people, the conservatives. The final decisions would be made by Deng Xiao Ping. But Deng Xiao Ping remained aloof. He never saw me and I never saw him but he did have my letter. It was I who proposed.

Swent: You were the scapegoat--

Lin: Scapegoat. [laughs] So, okay. We got out of this meeting. Zhao Zi Yang clearly wanted this route. He's a forward-thinking man. And he knew there were counterpart conservatives in the back and Deng Xiao Ping still remained aloof. But clearly, they feel, you see, Deng Xiao Ping will not tell Jiang Ze Min or anyone else exactly what he thinks. He behaves in such a way that he appears neutral. He should have done the thing much better before, but it's too late. There's no other way by that time. Which is a terrible thing, so people attack him. But still, people understood that he had to take a drastic measure. He's thinking of the country. Right or wrong.

May 1989, Meeting in Shanghai to Promote the Pudong Project

Lin: But anyway, it was 1987 when I went to see the premier. Then we had another meeting in Shanghai in 1988. It was in April, I think. Or thereabout. Had a big meeting of all people related to the Pudong development. We were housed at the Shanghai special resort hotel where Mao Ze Dong and others were there used to convene. So we had maybe one or two hundred people there, discussing the development of Pudong.

Swent: The project was to be undertaken by the city, not the province?

Lin: No, by the independent city government.

Swent: And so that's why they had to have the municipal funds to do it?

Lin: Yes. Now the municipal funds up to that time were mostly controlled by the central government. Shanghai has to submit all its income, some 90 percent, to be distributed by the central government, not back to Shanghai but to other places. Because the communist theory wanted to even it out. That's why Shanghai development was very slow for maybe twenty years. Until Wang Dao Han resigned, and Jiang Ze Min took over, they began to release more money to the Shanghai municipality. Which was then able to better things within the city and make the people happier. So Shanghai people say, "Wow! Jiang Ze Min is good. Give us more money." Actually not him, it's the central government.

Swent: Shanghai is the largest city, isn't it?

Lin: Yes! And makes the most money. For one time, it contributed 1/6 of the total central government income. So Shanghai people say, we built 1/6 of Beijing. Just one city contribute 1/6 of the total. But it's the city that made money. And the money was all taken to build Beijing, not to build Shanghai. Now, continue with our story of Pudong. At that 1988 meeting, discussion had gone on for two or three years; people on both sides had expressed their opinions, written and published. Develop Pudong, yes! No! From both sides. And the government, at the very beginning already knew it's going to be yes, but it played the game of letting them say. And gradually the papers slanted more and more towards yes. And finally, it's "Oh yes!" See.

##

Lin: I was fortunate to be able to understand the Chinese people and also much of the Communist party through Wang Dao Han and Jiang Ze Min. So I knew the situation. Just the very fact that I understood them, they paid great respect to me. So whatever I said was not an overreaction, but rather a proper judgment. In fact, anything I said, they believed me.

I understood them. Now. At that big meeting, which lasted about five days, at the suburb, Jing Ahn Bieh Tsu, I think. I think it's Shanghai Jing Ahn suburb hotel. It's a large hotel, for official meetings.

Swent: And this was a high-level meeting?

Lin: Very high-level meeting. So I gathered ten or twelve people from USA to go there.

Swent: Engineers or political people?

Lin: Not political, but commercial and financial.

Swent: Capitalists.

Lin: Capitalists. [laughs] I gathered these capitalists. Very good people.

Swent: Who were some of these people, do you remember?

Lin: Well, Kidder Peabody, Wells Fargo, an accounting company, et cetera. I had a list of names in your files there.

Swent: So these are financial people.

Lin: Financial. Yes. Hoping they would finance. Dr. Akl went to that meeting also. So each one gave a paper. Clearly the direction was set, that we will develop Pudong. But how? Where will the money come from? Where's the political approval? They say after this meeting, they will present our entire findings to Deng Xiao Ping; hopefully Deng would say yes. And then, June 4, 1989, came the Tien An Men affair. I thought Pudong project is gone, because all of those who worked with me among the Communist party were progressives. Apparently this Tien An Men is a show of strength of the conservatives. Gunning down the students. So I thought the whole thing was gone.

That's why I say that in China you can not always predict correctly. You say it's going to hell; it may come out good. You say it's going to be good; it may go to hell. So I decided it's gone. But near the end of that year, 1989, after all the turmoil was over, Jiang Ze Min the mayor, Zhu Rong Ji the vice mayor, Wang Dao Han the previous mayor--they secretly--not really secretly, but somewhat--arranged a meeting to get Deng Xiao Ping from

Beijing to visit Shanghai, early 1990. In a huddled room, not too many people, they discussed the development of Pudong.

Deng Xiao Ping Supports It and the Bridge Is Built at Top Speed

Lin: They sold the whole idea to Deng Xiao Ping. I was not there, but from what I heard from them, they advised Deng that this was the critical moment. "We, the Communist Party and the Chinese, China, must show to the country and the world that we are progressive, without saying so, but by building up Pudong." So the entire affair of developing Pudong become of national and perhaps international significance. Deng Xiao Ping was very smart. He was bad at Tien An Men, having ordered the gunmen to shoot, and now: "You must build Pudong" to show constructivity.

I heard at that meeting, Li Peng was not there, and at the end, Deng Xiao Ping, [says in Mandarin "Pai Zuo Zi"], slapped the table and said, "Must do it." Do this to show that we really want to develop China along the lines of market economy. Market socialist economy. [laughter]

And then the question was raised about Li Peng, who was the premier, but not at the Shanghai meeting. Someone brought up the question, "How should we talk to Li Peng?" And Deng Xiao Ping said, "I will talk to him." So that silenced all the conservatives. Here Deng Xiao Ping had shifted to the progressive side. Deng Xiao Ping held the power, and showed it right here.

This is exactly Jiang Ze Min's doing. He held the power now, Jiang Ze Min. At first he did not, and he cannot be partial to the left or to the right. Now he had to do it the correct way. "We're going to develop Pudong as the first sample of a market socialist economy." So this was carried out at top speed. And the bridge was finished in two years. The bridge was designed without me. They took my concept and carried it out.

Swent: Does this go back to the book that you sent in 1980?

Lin: Yes, 1980. It's exactly the same bridge concept, but in much more detail of course. What I presented was a concept. Cable-stayed bridge and a spiral approach going up. Now, in China, the engineers were in such a poor position, fighting for their pay, money, and power. So the institute who got that bridge design, designed the whole bridge quite well, and got it done. Not as good as if I had taken part, but without mentioning one word of T.Y. Lin. Because they want to get all the credit to themselves.

I didn't care. I don't care for designing the bridge. I'm interested in developing Pudong, to develop all of China.

This kind of thing, as I said, I could have got the training from youth, to help the country. That's what I wanted to do. So I did that. Wang Dao Han said to me the next year, "T.Y., I'm sorry. But these engineers who designed the bridge according to your concept didn't mention your name at all. This is terrible." He apologized. But he had no power to control the people down below. China is so big. I just smiled it off. I'm not interested in getting the name of designing that bridge. I've designed bigger things. [laughs] But the Pudong move was a bigger satisfaction.

Anyway that engineer in charge was another Lin. He was later on given a high honor in China, as the number-one bridge engineer. Fine. Never mentioned my name, although he took the whole concept from my pamphlet. But that doesn't matter. The important thing was changing the technical design into an economical constitutional approach. That's why I'm happy. I did not know that Jiang Ze Min, Wang Dao Han, and Zhu Rong Ji took the whole thing, and changed it into what they call it the Dragon's Head.

The dragon is the Yangtze River; the head is in Shanghai. Develop this Dragon Head as a show of Chinese socialistic market economy. [laughs] Lately, I think the development is not that good, but as good as China can do. If I were in China, I might make some more fancy and bigger designs. But in general, they were okay. So this was done.

Swent: The bridge is standing.

Lin: Oh, by the way, Professor Gerwick went to see the bridge and he remarked, "It's very well built, both steel and concrete. In detail, every part." He knew construction and he said it was very well done. It proved the Chinese can do it. They designed the bridge; they built the bridge. They financed the bridge, although idea came from here. So this initial idea and actually expanding the idea into a show of market economy and development of Pudong--I'm very happy. I don't even want to say that, but now it's turned out okay. Now the Communist party is giving a lot of credit to me, as they said, "We'll not forget you."

Now they give me credit. I didn't need that at the beginning; I don't need that now; but, there they are. They respect me; for example, this article on T.Y. Lin appeared in the first issue of the Pudong magazine, 1999, the first issue; you have that? "We cannot forget you." As quoted from Wang Dao Han. "T.Y. Lin was the first one who pioneered the Pudong development."

Swent: So now you're getting full credit.

Lin: Even before that, I think I told you this; I'll repeat again. About four or five years ago, the Pudong magistrate or mayor Zhao Xi Jeng was here in San Francisco at the invitation of Bechtel. So Bechtel gave a party of about eight tables. At the end of the banquet, Bechtel asked the mayor to talk. So he went up the stage. He said, "Do you know the development of Pudong mostly resulted from a very important person who is here. And this is T.Y. Lin." And I stood up. "He not only initiated the idea and followed through but he would not take a penny for it." That's what he said, in front of all of Bechtel people.

Bechtel was surprised. But knowing me, and knowing the Chinese somewhat, they probably didn't see this as unusual. In China, if I got the money, paid for it, I would be looked upon as an ordinary commercial [person], whereas in fact, I'm just trying to help the country, perhaps changing the system in a way. I took a picture with Jiang Ze Min in his Beijing palace and another with Zhu Rong Ji here in my office, 315 Bay Street, in our conference room.

Zhu Rong Ji Sees a Bridge as a Political Symbol

Swent: And that's the picture--

Lin: This picture, actually, may be at a restaurant. Zhu Rong Ji was here. He came to my office for one whole day. So we discussed the Hwang Pu Bridge. That was before the bridge was built, he was here discussing with me how to build the bridge. And then, I ask him, "Do you think you are going to build a bridge or a tunnel?" Many people advocated a tunnel.

You know what he said? "Of course a bridge; who can see a tunnel?" He had the political thinking, you see.

Swent: He wanted it as a visible symbol.

Lin: Visible symbol. Later, I learned he said the same thing at an important meeting in Shanghai when there was a fight between bridge and tunnel. And he said, "We want a bridge." So he has political thinking. At the same time, he told me, which was not untrue, but you have to understood a person's point of view. At one point he said, "You know, Professor Lin, I am not a politician." But later on, he remarked, "I want to build bridge; who could see a tunnel?" That's a politician's saying.

However, you have to really understand him. He is a statesman. Really very good statesman. He's not so good in politics and does not play politics. He play politics hard by being the proper statesman. That's why I say he was elevated from vice mayor to mayor to vice premier to premier. But on the move he has made all kinds of enemies. Of course, he did right things and offended all the bad people. I think he's just superb! That guy has guts! Has guts. And knew how to do it. He surrounded himself with many good people. That's what others told me. He's doing a very good job up to now. We have another story that will come later about him. But this is here. What year was that? 1989. Just around Tien An Men. About '89. Again. I cannot remember before or after.

Swent: The other picture was taken recently.

Lin: This taken later. That will have story to tell later. This was in Tien An Men when he became the president. After he was president is another long story.

Swent: I have another question about Pudong then. You said that you took Kidder Peabody, and Wells Fargo and all those people with you. Did they then consent, were they invited to help finance?

Lin: No. Now what happened was very interesting. I had figured that they would invite them; that's why I brought them there. And they had somewhat hoped that. But apparently the Chinese, once they decided to do it, they financed the whole thing themselves. The bridge was essentially financed by the Chinese government.

Swent: So they found the money after all.

Lin: They found it. They have money. China, this is one thing you must know. China has a lot of money but not nearly enough for what needs to be done. Once they decided to build the bridge, most of the money came from them. Some foreign loans, yes. Once they decided to develop Pudong, they built all the roads. For infrastructure, sewerage and so forth, they had the money. They didn't need foreign aid. At first, I thought they need all foreign aid. But they had all that money. Once they decided to go, when Deng Xiao Ping said "Go," they went. They had all the money. Of course, the individual lots were sold or leased to foreigners. But the total financing was not foreign.

I think it was clever but also not good. If they are clever, they would have full control. If they are not as good, the standard will not be as high. If you really had the American money, I think they could have built something more spectacular. More spectacular. Of course their idea is different from mine. I thought we need to get that foreign seed money to develop but they had the seed money. So once they took the idea, they did themselves. That's why China is something you don't expect. They had that money. But there's not nearly enough to cover everything.

Swent: You have to allocate it.

Lin: Allocate it. Then there's nothing left, almost.

Swent: Did Bechtel do any of the construction? Where did they come into the picture?

Lin: Bechtel still had a good office in Beijing, and they have not got enough jobs to sustain it. They're still there. Like me. I spent a whole lot of effort, and money, in China. Haven't got anywhere. You see, the problem is, I think, both Bechtel and me do not really understand the Chinese situation. And if we do, we cannot follow it. I think to do a job in China you must be able to get the right person in charge, who may be the last tier or second tier or the higher tier or whatever it is. Or get the consent of two or more tiers to help you.

To do that, you have to play games and maybe, even, to use the word, bribes. I cannot do that. Bechtel cannot do that. So we two are not very successful. Now, most of the Americans can handle the situation. You set up a GE [General Electric] plant, you do not deal much with the government.

Swent: But who builds the GE plant then?

Lin: I don't know. GE uses the Chinese people. The money comes from GE. All these companies, they are okay in China. So once, our Committee of 100 made a survey of American evaluation of the Chinese market. The one who gave about 80 percent approval was a group of American workers, or leaders who have worked in China, who have some plants in China. They get by with the Chinese. Eighty percent liked them. Then down to next group, the Chinese Americans something like 50 percent approval. Then down to the general public who know little about China, they have 30 percent approval. The last are our congressmen, who had something about 15 percent approval. There's a whole report on that. Very interesting.

Those who understand China, I think is the American merchant or developers or industrialists. Those went on a regular approach. And the Chinese respect them. They bring in money. Went very well. The Chinese American, so-so. Then you're down to the common people who don't understand China. Congressmen are very negative. Now, where were we?

Swent: This is on a side issue perhaps. Going back in time a number of years, did you ever try to do any work in Vietnam?

Lin: No, never did. I passed by through Vietnam; never did any work. I passed by through Vietnam before the French left, after that I didn't do anything.

Swent: And during the war did you do any contracting?

Lin: No. Not there. What question do you have?

Swent: I was thinking. It came to mind because you were saying that you were unable to work in Louisiana because of the political situation, and I was thinking of the Texas firms, when Johnson was president, who got the contracts in Vietnam. I wondered whether you had ever tried to get military contracts.

Lin: No. Never did. Never did. Never did try that out. I don't know why.

Swent: Were there any military contracts in general that you ever built?

Lin: No. No. No.

Swent: Bridges for the army--you worked with the state here, but the Corps of Engineers?

Lin: Corps of Engineers, on dams, just that big one.

You know, my general impression of the Corps of Engineers is very good. Because we have three retired army people working in old T.Y. International and everyone was so straight, so reliable. Just wonderful people. So I concluded that the Army Corps of Engineers, probably the army, were trained in very proper manner. They would not go for bribes or anything like that. They were very well trained.

One of our vice presidents is Duncan Joy; he retired now. He was here in this room last month. His father was Admiral Joy, who went to Shanghai just after the war, I think. His son, Duncan Joy, was here last month. He worked with us for ten or twelve years after retirement. They were all straightforward. I don't know how they were trained. Very good people.

Now, in China, now, did you see this big celebration two days ago? They had a show of force.

Swent: This is their fiftieth anniversary.

Lin: Yes. But I was surprised at how Jiang Ze Min managed to get rid of all the commercial work carried on by these military people the last thirty, forty years. The papers say Jiang will get rid of all this. I don't know if he has or has not. Definitely that is what they are going to do. Their army controlled everything in China. The customs. They can ship in a thousand automobiles with no tax. I don't know how Jiang Ze Min can stop it all. I am very concerned. He declared to do that and he needs to do it. In China, you see, this kind of discipline is necessary.

Swent: With one billion people.

Lin: One billion. I think their show of force is necessary to show to the people. But we in this country want China to be more democratic. China cannot. The people are not qualified and not rich enough to be that. For now, we just hope we have a benevolent dictatorship.

Swent: Yes. And they have had that at times.

Lin: At times. During the Cultural Revolution was the worst! Of course it was a worst dictatorship.

Swent: That was awful!

Lin: But anyway that's the danger of dictatorship. But we will not talk about that now.

Zhu Rong Ji Copies Lin's Ohio River Bridge

Lin: About Shanghai, back to Pudong. So, we build this bridge and during the same session when Zhu Rong Ji was here, about 1991, I gave him a picture of a cable-stayed bridge we built in Ohio over the Ohio River. Which is this one, the Weirton. [looks at picture]

And look at the next one; Zhu Rong Ji had it built in China after he took that picture back. [laughs] When he was here, I gave him that picture; he took it back, and after two years they built this one.

Swent: Where is that one?

Lin: That's in Shanghai. Hwang Pu River. Now the one I show you first was the first bridge across the Hwang Pu River. This is the second. Now, I think it was some eight years ago.

Swent: Did it have the same spiral approach?

Lin: No spiral. And that location did not need a spiral. The approaches were straightforward. You see, the other one is close to the city center and needed a spiral. And this one down near the mouth of the river, one can go straight.

Swent: So now there are two bridges across the Hwang Pu?

Lin: Now there may be others after these. They are getting three or four pretty soon. I don't even follow it.

Swent: Now that it's developed, they need more.

Lin: Yes. Yes. You see. This is the kind of thing I had to explain when I first got pictures of New York, Chicago, London, to see how many bridges they have that go across the river.

Swent: It's so exciting.

Lin: Very interesting too. I feel very, very good.

Swent: You should. And now you're getting recognized for it too.

Lin: Yes; while getting others' recognition is satisfying, getting my own self-recognition is more important.

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Swent: Do you think that the second bridge that they built was better than the first one?

Lin: Yes. And longer too. And looked better.

Swent: And again it was cable-stayed and used your idea; just from a picture they took of that and copied it?

Lin: Yes. They used the tower shape from one Ohio River bridge and did a good job. Chinese bridge engineers are okay. But for them to do new things, there's a shortage of concept. Once they gain the concept they can do it.

Swent: And now the materials that they use are local materials.

Lin: Oh yes! All local. I think it's almost all local now. The prestressing cables and anchorages, I think they are all local.

Swent: And do you think they're adequate?

Lin: Oh, yes. They can do that.

Swent: I've heard so much concern about the Yangtze dams, whether their concrete is good enough.

Lin: You see, our idea about China, the newspaper want to say the bad part. It's more exciting to criticize Communist China. Now, Chinese engineers are quite okay, but the whole organization and the background is not good enough. So this one, for example--

Swent: Is that Ruck-A-Chucky?

Lin: That's Ruck-A-Chucky.

Swent: Yes, the picture on the front.

"Creative Engineering to Build up China": Beijing, 1999

Lin: But the paper is "Creative Engineering to Help Build Up the Country."

Swent: This is your talk at the Beijing conference, August, 1999.

Lin: A month ago. Look at this.

Swent: I wish I could read Chinese. [laughs]

Lin: Look at the pictures; these are very exciting. That's my picture in Chengdu-Chongqing Railway. Sixty years ago I built [it]. And later on, in Taiwan, we built this bridge, a world-acclaimed beautiful bridge.

Swent: That's the one that's on the stamp.

Lin: Yes. On the stamp. That's my prestressed testing at Berkeley; that's my roof over the Venezuela horse-race track and the back of that roof. Look at how thin it is.

Swent: Beautiful.

Lin: And then the Moscone Center. And this is Kuala Lumpur. Beijing is designing a beautiful building now, designed by French winner of the international competition right near Tien An Men. Not quite as big as this, but similar. This by another French architect. But I didn't engineer it. Or we didn't. See that's this thirty-story concrete tower. This one here.

Swent: Is that Emeryville or Singapore?

Lin: Emeryville.

And look at this is. They wanted to build this building on a hillside. In order to hold it from sliding down, they had to anchor it. It would cost them $50 million to anchor it. So I said, don't construct an upright building. Lie it on the hillside. Beautiful, see. And this saved fifty million bucks. The regular upright [building] costs too much. But they can finance the other buiilding for $50 million less. They built this sleeping on the hillside. In one year, all sold out. They made big money out of this. In Manila, Philippines. That's San Francisco, Snake River, Columbia River, Rio Colorado River, that's Mississippi River, and this is the Taiwan one, and this is the curved bridge. All these, you see.

Swent: These were all the illustrations that were done with your talk.

Lin: In Beijing. Presented by video. And Singapore. Singapore Video. In People's Republic of China we did this one; it's on one column. From this one, I got this idea for the rehab[ilitation] of the Oakland Bay Bridge. And that's the Shanghai one. That's the Peace Bridge.

Swent: Your photograph with Reagan.

Lin: Reagan. There was a very interesting article just written about me and this. It said, "T.Y. is a good promoter. He doesn't miss any opportunity to build a bridge." [laughs] And here's the Gibraltar Bridge.

Swent: Gibraltar Bridge.

Lin: And this is the one now designed for the Yangtze River. And Chinese engineers designed it for the Yangtze River. They designed it like this one.

Swent: That's suspension.

Lin: Suspension. I think must go back to this one, so there's this big fight right now--

Swent: Between suspension and cable-stayed--

Lin: Yes. This, you see, this is pioneered by a lady engineer in charge in Nanjing. She never designed this thing like that, but wanted to design the longest suspension span in China. But I wrote against and it's still been fought.

Swent: And that's over the Yangtze itself.

Lin: Yes. Over the Yangtze; it's a big river. This is longer than Golden Gate Bridge. You know how much money they are going to spend? Seventy million U.S. dollars more, they admit, but they would set a record in China. That's crazy.

So Zhu Rong Ji had this meeting. Finally Y.C. Yang went; I didn't go. Zhu Rong Ji said, "Even if we save ten million, it's worth saving. They are talking about seventy million dollars; why not save it?" But they want to make a name, "I built a bridge longer than Golden Gate Bridge."

Swent: They want to break the record--

Lin: Break the record.

Swent: Even though the cable-stayed would be better.

Lin: Better. Save 70 million bucks! They admit 70 million bucks, but they wanted to make a record. Terrible. So there is a big fight right now.

Swent: Why is the cable-stayed so much cheaper?

Lin: First of all, it's shorter. It doesn't have to be that long, and doesn't need the anchorage. Suspension requires two big anchors for the cable. And sitting on poor ground. Terrible! This is enough.

Swent: The two pillars?

Lin: The two pillars. Most expensive. And the span was much longer than necessary.

Swent: What a shame! And Y.C. Yang couldn't convince them?

Lin: Well, we convinced the chiefs, but chief has to listen to engineers down below. Zhu Rong Ji said, "It's a lot of savings." Down here, "We want to break the record."

Swent: Oh, what a shame!

Lin: What a shame. Hasn't decided yet, but we'll see.

Swent: Maybe they'll come around to the right decision.

Lin: Yes. I think they might. Where are we now?

Swent: You showed Zhu Rong Ji the picture, and they went back and built this bridge across the Yangtze.

T.Y. Lin's Letter Influences Jiang Ze Min's Thinking

Lin: Okay. Now since then, I have created a good relationship between myself and Jiang Ze Min and Zhu Rong Ji.

Swent: I should know, but to be clear--Jiang Ze Min is--?

Lin: Is president and party chief--

Swent: And Zhu Rong Ji?

Lin: Premier. Premier is number two. They go up together like that.

Swent: Jiang Ze Min is number one.

Lin: Jiang is number one--

Swent: --and Zhu Rong Ji is his--

Lin: --number two. But in rank, they put Li Peng as officially number two; he's head of the People's Assembly which is really not that important.

Swent: But you don't hear much from Li Peng now.

Lin: So both Jiang and Zhu moved to Beijing in 1990. Jiang had a meeting with Deng Xiao Peng, 1989, after the Tien An Men affair. During that crisis, Jiang Ze Min managed that Shanghai city very well and no trouble happened whereas Beijing got into a turmoil. So they discussed the details why and how he did that. Jiang Ze Min said something which pleased Deng Xiao Ping. "See, really our action was not wrong; we had to face the crisis, and maintain stability. The worst thing we have now is corruption. We have got to improve that." Deng Xiao Ping liked his talk and made him his successor. So Jiang brought Zhu Rong Ji to help him. Now they have been there for about nine years.

Swent: A long time.

Lin: Long time, long time. Finally Jiang has established himself as a good leader. He know how to get people working together. His approach is: to have people work together, we will have a stable country and can develop far ahead.

Now actually, his thinking came partly from me. Now when he went to Beijing, I wrote him a proposal, entitled "Political Modernization of the Chinese Government System in Stages." China is not ready to practice full democracy; it will eventually, but that will take decades, so I advised him not to change too fast. The people are not yet ready, particularly they were so poor and so uneducated.

I wrote that proposal on about six page in Chinese characters, and mailed it to him 1991. And he ordered his ambassador in Washington, D.C., to come to San Francisco to meet with Margaret and me at the consulate general. And he said, "President Jiang wants to invite you to go to China. He wants to talk with you."

Swent: Oh, my!

Lin: So we accepted the invitation and went there. And they set up the meeting in a big room at the palace. So Margaret and I were sitting there, and he came in and said, "Professor Lin, this morning I reread your proposal; I'll tell you what I think of it." And he went on for almost an hour and a half without stopping. He repeated my suggestions and critiqued them, mostly in favor. There were two or three minor points that he disagreed.

After his talk, I raised this question, "Did you discuss this with your Politburo?" Because I sent a copy to each of the seven members. He said, "Yes. We had a long discussion." He didn't say whether the Politburo approved it or not. Clearly, there was a division of thinking. The conservatives one way and the real progressives the other way. Clearly he wanted to follow my opinion. So that's when this picture was taken, on our way out of the hall. That's in the Great Reception Hall, Tien An Men Square. Jiang Ze Min, myself, and Margaret with a background of big paintings behind.

It's very clear. If you want to help these people, you have to understand them. You understand them, and let them understand you, then everything is easy. I've achieved this point with Jiang Ze Min and Zhu Rong Ji. So they said the right things to me, and I said the right things to them. So, okay, since then, he has been exactly using that approach, progress in stages.

Now, whether I initiated it or not, I don't know. He probably had that thinking already and I just brought it out. Or he was somewhere there, and I led him really into it, I don't know. He's going slowly, peacefully, and optimizing it in some way. And the American newspapers criticize him. "That guy has no power. He's just a compromiser. He's not trying to show power." He was showing ability to compromise, which I call optimize. You put the people together, understand both sides, and settle for an optimized approach, or a compromise. Doing this all the time.

Meanwhile, I have been corresponding with him, and congratulating him. The last one, I wrote a short poem about his second reelection, in four lines and four words each. I sent it to him. And he replied, in a very interesting letter. "Professor Lin, you really understand the country and you love the country."

Swent: Can you recite the poem?

Lin: I cannot; I'll have to dig it up. The four lines, and then his reply letters are also a few lines. Very good. And signed by himself. This was only two or three years ago. We have become very good friends already in Shanghai where we met at least a dozen times. He pays us very good respect.

T.Y. Lin Convinces Zhu Rong Ji to Adopt a New Land Policy

Lin: Now comes Zhu Rong Ji, so, when I visited Zhu Rong Ji as premier, or vice premier, I cannot remember now, in Beijing, I presented to him my theory of distributing all the land to the people. The whole country. First I wrote him and so forth; then we had a meeting, and Y.C. Yang was there too. And I told him, "Look here now, Premier Zhu, you or our country own all this land. Billions of acres. You have to maintain it, you have to keep it going, and it's taking up much of your money. Why not distribute it to the people at a low price? Say at 10 percent of its cost. People would be very interested in saving money and buying the land. Instead of selling, you lease it for a hundred years. And for the Chinese people that's good enough. That will last three or four generations. Once they got the land, they will develop it, build buildings, et cetera, and make money from it. You don't need to maintain it yourself. And they will then develop the land and pay tax. You just sit there and collect the tax, a typical American approach, you know? You'll get the money back and then the country has no fear of inflation."

Swent: No fear of inflation, you said?

Lin: Yes. Because if people get too much money, it may result in inflation. But if they use money to purchase the land, it's back to you. See, this is anti-Communist idea; it sounded strange to him so he said seriously, "I would have to digest this idea."

Swent: Yes, it certainly is a complete reversal of communism. [laughter]

Lin: Yes. In about fifteen minutes, he suddenly turned around. "Here, Professor Lin, I have digested it." So fast! You see, we turned over communism in fifteen minutes. And the next day, or the next week, I found out from Margaret's brother in Shanghai that they declared to sell the land out to the people.

Swent: My! So quickly!

Lin: You see, this you can do there, you must get to the right person who has the power. If he was convinced, he could sell it to the Politburo. At first he didn't think it was correct, but after fifteen minutes he digested the idea. And they began selling the idea among themselves.

However, after selling, they had all kinds of troubles which were somewhat expected. People didn't have enough money to buy the land; some people would rather have the government maintain the land, and so forth. But anyway, they are beginning to lease all the land to the people. I said, in addition, that at Shanghai, Pudong, we tried to sell the land to foreigners; they are richer. But now, we've got to go the next step and sell land to the people. They are in the process of doing that. But can you imagine thought like that, very basic, anti-communist and pro-democratic, can be bridged over by some explanation which is so simple that people will buy it. A long-time communist can change overnight! So first I helped to build the bridge across Whangpo, physically, to develop Pudong for a market economy, and then I tried to advocate changing the communist central control system, politically, into democracy in stages, and now back to selling all the land to the people. So all these ideas are adopted by the top people in the communist hierarchy. It took me a long while to develop my thinking, but I sold it in a few minutes each time.

Swent: You were in a unique position to do this.

Lin: Absolutely. So I felt I must do it, you know. If I don't do it, who will do it?

Swent: You were probably the only person who could have done it.

Lin: Apparently, so far. So Zhu Rong Ji was very interested in me and wanted to see me in Los Angeles, when he came in 1999. At that time, my health was not good enough; although I could go, I didn't go to see him.

Swent: He can't come here?

Lin: He can't come here to San Francisco.

Swent: Politically that would be wrong, I suppose.

Lin: Yes. Yes. Yes. So he asked me to see him, but I didn't go. Y.C. Yang took over to start a good relation with him, to meet him. Furthermore, I was short of big ideas to sell him, you know? [laughs]

Swent: Oh, you don't have any more ideas! Well! [laughs] You have had the best ideas there were.

Lin: This is all fascinating to me.

Swent: So important!

Lin: It's all bridging. It all started from bridging. See.

Swent: Well, if you can bridge that political ideological gap, that's the most important.

Lin: There's no question that this ideological gap exists in itself and must be bridged. Communism, at the beginning, had some very great ideas, anti-colonialism, anti-the old type of capitalism, but then they tried that in the modern world, where productivity is so important and people are better educated. Politics alone is not enough, but the people are gradually taking control. You cannot activate the people to work under communism and so forth. Probably what Marx had in mind was out of date! His ideas are no longer true. We must bridge to democracy.

Swent: Yes.

Lin: Now, I think, this is all we'll talk about China. We have some more to talk about China and America, how the two can get together. How to bridge across the Pacific!

Swent: Yes. You're not going to build a concrete bridge across the Pacific.

Lin: Not a concrete bridge. But the electronic bridge is there. Telecommunication is there.

Swent: That's right.

Lin: See, having that bridge, we have got to understand each other, but instead of using it to understand each other, often times we try to misinterpret and make the situation worse. You see, that will not succeed and we'll explain that next time.

XIII AWARDS, HONORS, AND PHILOSOPHY OF OPTIMIZATION

[Interview 11: October 19, 1999] ##

Asian Business League Award

Swent: This is our eleventh interview and you told me that you're off to do some traveling and receive still more honors in this coming week or two. Do you want to mention that?

Lin: Yes. This Saturday I will be in San Francisco, speaking to the Asian Business League at their annual meeting. Not really speaking, but they will give me an award. Well, lots of prominent business people did anyway--this really is not my line.

Swent: But you have done a lot of business in Asia.

Lin: Well, not in Asia, but as an Asian American businessman I am qualified in a way. Anyway, this week, I will be there to receive an honor award.

American Society of Civil Engineers Award

Lin: And then next week I got two of those things. Wednesday, speaking in Cleveland, Ohio, to the American Society of Civil Engineers. Their chapter is giving me an award. And that award happened to have been given to my friend Gerwick a few years ago. And this time it's my turn. So I will get this one and give a speech. And Friday back home.

Swent: You say you have to give a speech in connection with this award? What will you speak about?

Lin: A topic has been chosen as "Creative Engineering for Bridges and Buildings." All about how to do it. That's the topic of

Wednesday. Next Wednesday. And the same Friday, rush back here to talk to the Asian American Architects and Engineers.

Asian American Architects and Engineers

Swent: That's directly related with what you've done.

Lin: Yes. So my topic is "Interaction between Architects and Engineers." That's a very interesting one, anyway. That's for Friday of next week. So I've got three engagements this week. They're all coming in a rush. Every year I get two or three awards, so for about fifty years, I've got over a hundred awards.

Swent: That's the price you pay for being successful.

Lin: Yes. Yes. I never accept any payment for my talks. If I can do it and like it, I accept it. And this time, going to Cleveland, we got a United Mileage free trip. So they say they will pay me $1,200 for using that ticket. [laughs] So I get $1,200. That's very unusual.

Speaking Successfully with Slides, No Notes

Swent: How do you write your speeches?

Lin: I never did write a speech and I'm very funny; if I wrote one, maybe I did a bad one. Off the cuff, usually using my slides, I gave good talks.

Swent: Do you have any kinds of notes?

Lin: No. No. Because the slides are my notes. Occasionally, I made some outline. I figure out, people differ. Myself is used to this kind of off-the-cuff talk. If I read, my mind is on the manuscript, and my thinking does not get over to the audience. If I think, the wave flows directly to the audience. My talk usually varies with the response of the audience. Sometimes the audience did not respond as well and my talk was not so good. So [there is] this flow of energy or electricity between me and the audience, but I cannot read a written one.

Only once when I accept the doctoral degree at the Chinese Hong Kong University, Margaret said, "You gave the worst talk ever!" I prepared for several days. Finally I got one page or less of a responding speech. And it went very badly. The audience was also poor too. So that's worse. So from then on, I never wrote my speech.

I couldn't! If I wrote it, it become bad. I simply have to watch the audience and respond to the audience. Usually I'll make some humorous jokes somewhere, and if that brought down the audience, then I was inspired, and I did a good job all the way. If that sank in, and didn't affect them, then it's bad. [laughter] It's so funny! So that's how it is.

Swent: These are topics, of course, that you've done a lot of thinking about.

Lin: Most of these topics are, because the slides are my familiar slides and the topics are my familiar topics. The two talks I'm going to give were familiar ones, but very seldom I made a repetition, because it would be no challenge. Okay, now what else questions you have?

Rebuilding the Oakland-East Bay Bridge

Swent: Well, we thought that we would talk today about the bridge. Shall we begin with that?

Lin: All right. So today we'll talk about the last bridge; that is, the rebuilding of the East Bay half of the San Francisco Bay Bridge. Now this is an interesting one. And that one, I only partially succeeded. But even that is very interesting. The story begins early in March 1997, when CalTrans decided on replacing the existing eastern half of the Bay Bridge with a new bridge. And they came out with a somewhat old-fashioned design, using two big piers in the deepest part of the channel. The plans appeared not so inspiring. So the Chronicle architectural critic Allan Temko, who happened to be my close friend, called me up one day, and said, "T.Y., can you get a better design for this bridge that will inspire the people?" I thought for about two weeks, and we had it published and this really aroused the whole region. He was so excited about my bridge, which I claimed to cost $200 million less than their bridge. And looks much more beautiful.

Swent: Wasn't there a conflict here though, because your former company, which has your name, was the company that had submitted the design that you thought was not so good?

Lin: No, there was no conflict at all. The not-so-good layout was by CalTrans [engineers], many of them my former students. At this moment, I was not representing my company. I was an independent engineer. Later on, about two years later, it happened that the job was given to my company to perform the design.

Swent: I see. At that time, the T.Y. Lin company was not designing it?

Lin: I have disowned or sold the firm [laughs] for about ten years.

Swent: Yes. I realize that. Yes, but of course, it still had your name.

Lin: Well, lots of people misunderstood, even the public and newspapers. [They said] CalTrans has a conflict of interest here with T.Y. Lin. He got a hold of this idea, you used it, and now you engaged the firm to design the whole thing.

Swent: By "he," do you mean Allan Temko?

Lin: No. No. Someone else who didn't know the situation. Allan Temko knew it. So Allan Temko was not asking the firm to help; he was asking me personally. And I personally in two weeks came out with a much better idea and that idea was discussed for almost two years, until earlier this year, 1999. They decided to go almost essentially my way and gave the job after choosing among many, to my old firm. They also knew that I have nothing to do with the old firm. I'm not getting even a dollar from them. See, I own nothing. It's very interesting. So that made me very well known, good or bad, you know? [laughter]

A Philosophical Look at a Good Technical Solution

Lin: Now, the design of the bridge is very interesting. See this here? The east section of the bay, Treasure Island to Oakland. And here's the deep ocean. Here is the deep section.

Swent: The deep section is right adjacent to Treasure Island.

Lin: Yes. Used to be a cantilever steel truss bridge. Now we will replace it. CalTrans came up with their design using two piers in very deep water. Very deep water. So you got a costly design. I took out these two piers, but put a pier near the tip of Treasure Island. Single pier. On rock, not in water. And this stretches out some 1,100 feet or whatever to clear span this deep area. So I save the two deep-water piers with a pier on top of rock.

Now, my design is a very unusual one. It's a single-tower, cable-stayed, un-symmetrical span. Cable-stays would pull the gravity load from the deck to the tower top. And un-symmetrical because this is the deep part in water, and with the back part anchored on Treasure Island, it doesn't have to be that big. And that gives it a nice touch. People look at it, know, I'm stretching out my arm here. Anchor back with a shorter span to hold up the long span. See, the idea results from a philosophical look at a technical solution. Of course technically, it is a very good one.

Poetic Singularity and the Metropolitan Transportation Commission

Lin: Now, actually I designed a somewhat similar bridge in China, and which had just been built at that time: about half as big; one pier and two sides symmetrical, at the foot of Huang Shan, Yellow Mountain, Ang Hwei, very scenic place. That's just completed. So I got the idea of the single tower, and the word single, singularity, is very poetic in China. Most Chinese says "One", Chinese poems say that this is one or unique. Two is different. For example: "one arch moon" emphasized the beautiful evening.

Now people know this one pier is a very economical way, instead of two. So I proposed this from a poetic point of view, fit into the environment and backed by technology. Because all the erection of this long span, 1,100 feet, would be tied by these cables and anchored back here. See, no falsework required. This was naturally the best way. So it immediately aroused the praise of all the Bay Area residents, and CalTrans were forced by MTC to reconsider their design.

Swent: What's MTC?

Lin: MTC is Metropolitan Transportation Commission. Which has the responsibility for designing this bridge. CalTrans will do the work, but they will scheme the thing so they had the power, MTC. So MTC together with CalTrans gathered a commission, a panel of some thirty-five engineers and architects, to look the whole thing over.

I was sitting on that commission as well. Gerwick, others also had proposals. There must be some twelve proposals looked over by this panel. The panel, finally, after almost two years of meeting, selected my one-pier layout supporting a half suspension bridge, using a single tower, yes, but suspension instead of the cable-stayed layout I proposed. This is how it looks. See.

Curved. It's curved, half-span of a complete suspension bridge. This will cost much more money than a cable-stayed [bridge] and looks unreasonable. A terrible mistake.

Final Design "A Monument to Stupidity"

Lin: At the meeting before the last one, everybody was for my proposal completely. But at the final meeting, a vote was taken; twelve voted for this new design, the suspension, seven for my cable-stayed design. So I lost the vote. And I left a word with them, "This will be building a monument to stupidity." Because this is illogical. How can you build half of a suspension! Golden Gate is a full suspension. You'll build a half one trying to match it. This half one cannot be built without falsework. You will have to support all of that half span, and then hang the cables on and then remove the support. It's very expensive and will look foolish. But, for whatever reason, I don't know, between the two weeks, the final meeting and the one before that, several engineers and architects changed their mind. I think they have had some, what you call this, smoke-filled sessions, and decided on this, for whatever reason.

I don't know; I have no proof. But anyway, I left my words, as quoted in the papers. T.Y. Lin said, "This will be a monument to stupidity."

Swent: What a shame!

Lin: What a shame. But I lost. And it's too late to change now. But anyway, it shows how people could change in two weeks for whatever reason. Because T.Y. Lin International was designing this, of which I had no influence and nothing to do with. Between the two weeks from the old cable-stayed design to this suspension design, they made a beautiful model for suspension and got the vote for it. But I suspect they made some kind of arrangement which may never be known. So *c'est la vie*!

Swent: That was a not a technological decision.

Lin: Not a technological decision. But some of the engineers who voted for it said the reason was that this suspension looks like the eastern spans. The eastern spans have four of those piers, or two complete suspensions, but this suspension has one pier, half of a suspension bridge, never built before; it's very costly. So I asked the now T.Y. Lin firm people in charge how much more would this one cost compared to my original cable-stayed proposal. They said at least $50 million more.

Terrible! At least, it probably will come out seventy or more, and it will show a design blunder in their trying to imitate the curved suspension bridge.

They all knew that, but they voted for it. I do not know why they did. See, this is how wrong decisions can be made, and I think many people agree with me that the whole setup was wrong. They've got a commission of thirty-five architects and engineers; everyone has three minutes to talk at the meeting. Nobody can take hold of it. And finally, somehow, the thing was steered toward this stupid design.

Too Late to Change the Approach Span

Lin: Now, worse than that, the approaches. For the approaches they still plan a highway on stilts plan. Highway on stilts will be the eastern approach. Which is the same look as they now are. We all concentrated on this main span and nobody cared about the approach spans. After this was settled, it's too late to do anything here. And nothing was done. Oakland Mayor [Jerry] Brown was very much against it, and many others, but too late for him to do anything. In fact, at a previous meeting of our panel on the bridge, about two months ago [before], I stood up and gave them a better design for the eastern approaches. I showed it off. I said, "However, the one scheme I show now is new, and is less costly, and looks much better. But I'm not going to advocate it, because it's too late to make any change now." If you delay it another year to design a new bridge, maybe an earthquake happens, we'll get in trouble. Which is perhaps a remote justification, but anyway, that's where it is. So I gave up. So I had a partial failure in that I proposed a single-pier cable-stayed but they are using a single-pier suspension. And this I knew is bad but I cannot do anything about it. It's too late.

Swent: What did you prefer for the approach?

Lin: A series of arches. Very beautiful. I have sketches of that. And slides for that. But *c'est la vie*. Often times, my scheme is not taken. In fact, as I said before, out of every four proposals, I won one. So the other three was not. For this Bay Bridge rehab, my single-column idea is adopted, but my cable-stayed is changed into suspension. Presumably it looks comparable to the western portion of the suspension spans.

I have a Chinese story to quote here. That's about fifteen hundred years ago. The story of the Eastern Miss She imitating the Western She. The eastern suspension trying to imitate the western suspension.

There was a beautiful girl called the Western She, [Shi She], very beautiful, and one day she frowned her brows. People thought she was more beautiful. Look at the frown she put on. It increased her beauty. Then there was an Eastern She, on Eastern side of the river, she didn't look good at all, and she noticed the Western She frown, so she tried to imitate the frown, and it only made her more ugly! [laughs] So our half suspension span trying to imitate the two full western spans actually repeats the story! *C'est la vie, c'est la vie.*

Anyway, this will go on history. People eventually will say, "Why do we have such an unbecoming bridge?" But they, the proposer, will say, "It's a new type, there never was a bridge like that before." Furthermore, it looks like the eastern one. If Frank Lloyd Wright saw it, he would say, “It should be bombed!” The paper quoted me as saying that it was "a monument to ignorance if not stupidity."

Swent: And what firm is finally building it?

Lin: The designing firm is now still T.Y. Lin International, my old firm. My old firm. And their engineers in charge don't like that half-suspension design either. But the MTC gave them the order, and they took it; they took the order and design it. And most of the people said--and now having to do it, they said, "Oh, then we made a good design. We are able to do something new." But they all knew it was going to cost a lot of money and make no sense. Nonetheless they took orders from the MTC. The MTC is supervised by Mary King who is a good chair but she doesn't know engineering. But our panel failed. Why we voted? Panel about thirty-five people. Only nineteen appeared at that meeting. Twelve voted for suspension. Seven voted for cable-stayed.

Swent: Oh! But that's only about half the panel.

Lin: Yes. Exactly. Barely half the panel were there. Some voted for political reasons which I cannot understand.

Lin Designs Are Seismically Resistant

Swent: It's unfortunate. Now how do you feel about it from a seismic point of view?

Lin: No problem. I think neither has any seismic problem. This one they modified my column, by sort of splitting one column into four, but you look at it it's one column, but it's split into four for more [seismic resistance] redundancy, although it looks like one. Anyway, it's designed to be a seismic resistive structure.

Swent: Have you heard anything from Taiwan recently about any of the bridges that you built there?

Lin: None of my bridges and none of my buildings suffered any cracks.

Swent: Wonderful!

Lin: But that is not all because our designs were good. It's because the seismic center was near the center of the island and most of our structures were in the northern part, so we're sort of away from the center. But it's very nice. So we have people report, "Not one building cracked."

Seismically, you can't always tell. In general, our buildings are more seismic proof but this is not absolute.

Swent: How do you feel about the fact that people still confuse you and your company which has your name?

Lin: Well, you cannot blame them, because it's T.Y. Lin, both are T.Y. Lin. But this kind of thing often happens. I used the example of the dance studio which Margaret and I went to. Arthur Murray Studio. Arthur Murray sold his rights and everything, many years before he passed away. People call it still, Arthur Murray. And we met him and his wife, and people still associate him with the firm. Since I have taught for thirty years, I am used to share knowledge and experience with students and people, so I'll let them use T.Y. Lin name.

I simply have no interest in business. So I feel very curious to be invited by the businessmen. I did set up a business, I built my firm over five hundred people. It is quite a business but I didn't enjoy manipulating the money.

T.Y. Lin a Valuable Name for the Firm

Swent: If you had it to do over again would you do it differently?

Lin: No. Because I had to have a big firm to design the big bridges, such as the Ruck-A-Chucky. They wouldn't have given it to me if I didn't have a big firm. Now, in my new position of a smaller firm Lin Tung Yen China, it's more difficult to get big jobs.

Swent: Would you do the sale differently? Would you change the name of the firm?

Lin: No, I wouldn't. Because, see, people worked with me for decades; if I took off the name, they lost a lot. And so I have sold the firm to the people on an ESOP plan under which they didn't have to pay cash. Unfortunately, the buyer refused to pay the remaining half of the price and they are still in court now.

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Swent: You said you didn't want much money as long as you had enough to support yourself.

Lin: Yes. That's right. Also I still wouldn't like to manage the money. It took a lot of work. Unfortunately, they sold it to the wrong person. That's the trouble. I didn't do the selling, though.

His firm, Dar, is now number six in size in the whole world. He must have hundreds of million dollars. He also looks like a real gentleman, but I don't know why he would cheat them like that. So it's being settled in the court. We'll see whether the court will sustain the jury's findings.

Swent: What court is it in?

Lin: San Francisco. It's in superior court now. I had no part in the fight because I didn't get any dollar from them, and I never sold my name to them, you see. I never sold name to anyone but I did let them use it. Now, I think I cannot take the name back. But my personal name is still my personal name. The firm's name is theirs.

Swent: And of course that name is part of the value of the firm.

Lin: Yes. I don't want to take it back, didn't want to take it back, because that would hurt all the people that are working there.

Swent: Yes. It's hard to judge the worth of a reputation, isn't it?

Lin: Yes. Anything else? What other questions do you have?

Swent: I had a couple of general questions and then I know you wanted to talk about optimization. I wanted to ask in general if there were things you would do differently now if you had to do it over again.

Lin: Now, one is from a managing point of view. I don't think we can do any better, because I'm no better myself. So couldn't do any better. The trick there is in using the right people and it happens that all my partners were pretty capable. One reason was that I always shared my profit with the leaders fifty-fifty, first with Rice, then Felix Kulka, then Y.C. Yang. I shared fifty-fifty, and they knew that technically, I contributed the most, but managerial-wise, they took care. I don't think I would change that kind of work division.

The other thing is in engineering, there is a so-called factor of safety. You design for the optimum condition; if you are not there, you may still be far from failure, so I never had any problems. On the other hand, as I said, out of four proposals, I will only win one; I wish I could do differently on the other three. [laughter]

Lin and the University: A Mutual Advantage

Swent: Did you ever consider leaving the university?

Lin: No. I taught there for thirty years; I started the firm in 1953 only after about seven years teaching. The university let me do it because I did not neglect the university duty and, in fact, it helped the university's name. Then, what was your question now?

Swent: I was wondering whether you had ever considered not teaching and devoting all of your time to your business.

Lin: I taught thirty years; okay? Retired in 1976. Twenty-three years now, but before that I taught thirty years. About 1973 or '4, one of my students was talking to me and I mentioned to them that I had a big firm outside; you know what he said? "I would quit teaching now! Since the money you can make outside is more than the university salary."

That seemed to start me thinking, so three years after that, whether because of what he said, or because of my own choice, I quit the university. Before that, I never thought of leaving the university, because actually the university helped me. Without the university laboratory, I could have never developed prestressed concrete as well or as fast. So the university helped me a great deal and I had a great time with the university, so I never thought of leaving it. Then I thought, thirty years is a good number.

Changing Policy on Hiring Students

Swent: I just happened yesterday to be talking with a young woman who's my neighbor, who has an engineering business; she has helped me with some decisions around my home. She did not go to Berkeley; she went to Cal Poly. She told me that she treasures a letter that she once received from you. When she was a young college student, she wrote to your firm and asked for a summer job--she dreamed of working with T.Y. Lin and you wrote her, she said, a very charming and lovely letter telling her that you never hired students. That you had a policy not to hire students.

Lin: No, later on we must have changed that policy. At that time maybe.

Swent: She said she treasures this letter from you.

Lin: No. I never hired her.

Swent: No, you didn't hire her but she went on and she has a good engineering business now.

Lin: Great. Yes. Cal Poly is a good school. In fact, later on, I hired many from Cal Poly. And that was pretty early in the game. I like Cal Poly a lot, but we did not hire summertime workers.

Swent: It would have been hard to choose among your own students I'm sure. What about other universities; do they have similar policies?

Lin: I think Cal and Stanford have similar policies. I only hired graduate students who had left the university, but never while studying at the university.

A Family of Achievers for Three Thousand Years

Swent: I also wanted to ask you more about your family. I have not yet talked at length with your brother but I did talk to your cousin and your sister-in-law, and this is such a remarkable family that you come from! There must have been some members of your family who were just average. But they all seem to be so outstandingly successful.

Lin: Well, depending upon how you compare it. Compared to common people we are all above that. But many of them are along that level. Along the common level. The reason being three thousand years of tradition. Particularly the last two centuries, our family advocates being scholarly and so on. So our son Paul, his wife, Lois, she's native American. She's a mix of German, French, English and whatever. So she went to one of those family reunions last year. She came back and said, "Say, Dad, how come your family members are all professionals and nobody mentioned making money?" In fact, that started about twenty generations ago. Did I tell you the story?

Swent: Yes, you did.

Lin: It's where the great-grandfather told his sons that you should all study classics, and classics, being a kind of a "jing", is much better than gold, which is the other "jing". You see, this jing is better than that jing. Classics better than gold. From then on, we all went along that line. Try to educate ourselves and look down on money. And this is very interesting. But now people may begin to change in America where money is the measure of success, and often rightly so.

Swent: But I'm thinking, even beyond that, even having chosen the classics, that you all just achieved to such a superior level.

Lin: Well, not everybody, but the ones you talked to; still it is impressive.

Swent: They're remarkably motivated.

Lin: Perhaps all those who have been in this country are among the better ones. But maybe it has to do with the genes.

Swent: The genes. [laughter] Maybe.

Lin: Yes. Yes. Yes.

Swent: Well, it is a remarkable family. Yes. Nobody seems to have just dropped along the wayside.

Lin: So our grandson, who is half Chinese, Erik, he's twenty-three years old now, graduated from Princeton with high honors; he got a National Science Foundation scholarship. So he's now working with Gerwick. And next year, he's going back to study at UC Berkeley on his scholarship.

Swent: Yes. It's a remarkably achieving family.

Lin: Yes. I'm very satisfied.

Swent: And apparently, all in extremely good health.

Lin: Well, yes. Up to now, when they got to seventy, eighty, ninety, they are fading. [laughter] But there were very few who died young. Mainly, those not so healthy.

Developing and Applying Theory for Use of Prestressed Concrete

Swent: Well, speaking of Gerwick, perhaps you'd like to look at this little green pamphlet and use that as a springboard for a discussion. Ben Gerwick sent me this green pamphlet that he mentioned, it's called "Precast, Prestressed Concrete Piles" and he told me that this little pamphlet was very important to him because he was able to hand it to people and it convinced them to use prestressed concrete.

Lin: At that time, in early 1950s I was developing prestressed concrete. All kinds of elements including piles. Now, these piles, I worked with Gerwick, his firm, and his father was active at that time. I remember I prepared a first one, only four sheets, including the calculations, formulas and tables. Now he has developed this into a pamphlet maybe twenty pages. And that's very impressive.

Swent: How did he happen to ask you to do that?

Lin: I was the only one who knew about prestressed concrete. And his father was right here. So I first worked with him and his father together. They had actually come to me since I taught at the university, gave a course on prestressed concrete. Maybe the only authority in that field. Gerwick, later on of course, went with me, to Russia, 1958. This was probably before '58.

Then he was president of Prestressed Concrete Institute which I helped organize when I returned from Belgium, and I think I served as vice president or something. Ben was president. And we together developed this and knew each other either through that or before that. I did all the calculations and tables for those files and pamphlets, and that seemed to work all right.

Swent: These are the strengths under direct loads. "Moment resisting capacities."

Lin: Yes. Yes. Those were figured out theoretically by me, myself and some were tested at Berkeley lab. In fact, I had a picture of the testing of such a pile at the Berkeley Engineering Laboratory.

Swent: "The Ultimate Moment Capacity of a Prestressed Pile."

Lin: Yes. Yes. This is nothing new now, but it was new at that time. If a pile is being driven, its failure occurs when the thing buckles. If I prestress it, its buckling strength is increased, and its capacity to resist driving is increased. How can that be proven in the laboratory? I can prove it first by theory and make those tables. Then I would test the same at the university laboratory.

Swent: What was the sequence? Did you observe the resistance and the buckling and so on first and then develop a theory to support it?

Lin: No. The other way. I started from theory very much. If in theory, this is true, the test in a laboratory should be just a confirmation. I think the theory is very important. At the Caracas grandstand roof, you see, three-inch shell sticks out ninety feet, curved. It's there now for fifty years. It's based on pure theory.

Swent: Pure theory first, and then the example.

Lin: Yes. You would like to reconfirm, but sometimes you couldn't wait. The Caracas thing is typical. There's a very well-known architect, engineer, Felix Candila of Mexico, who designed many beautiful thin shells in Mexico. About 1960, he came to UC Berkeley and gave a talk. Very good speaker. Beautiful shows of his work. When he looked at my Caracas roof shell, "You Americans (he called me American), you jump. You jump from small one to a real big one! I don't. I build a little one first, then increase it bit by bit."

He was right. He did not base his design on theoretical understanding. His forms were so complicated at that time, he or we cannot analyze it. Now with a computer, we could. But he has very unusual forms. Very beautiful. Much smaller than mine. Maybe a third of the size I have. And they stood all right. So he did it little by little. He said I jump. I may make a small model, which I didn't even make; I just know the theory. So I can jump to 90 feet at once. He probably would build 30 feet, 50 feet at most, or use a thicker shell. Beautiful. But he doesn't have the theory. You see, when you get to a new field like prestressed concrete, new theories can be developed and I did that and applied it. So that made me possible to jump. Yes.

Swent: But you have to have a lot of confidence to do that.

Lin: That's what Allan Temko and all of my friends and Scordelis, say: "T.Y. has courage." Courage comes from the real understanding; I was so sure! But the ability to say that minor errors here and there in workmanship and otherwise will not hurt the stability, that's also important. Due to workmanship for example. It's not going hurt the overall capacity. That's very important. I knew that. But major mistakes, the thing would collapse. Now actually, many of my structures were so far out that I've designed them with more safety than ordinary structures, because I was able to control the forces by prestressing. I tighten it here and there, where needed.

I often make it stronger. But theory is very important. The Ruck-A-Chucky design came purely from theory. And it came out with such a beauty as well as strength.

Swent: Do you think it will ever be built?

Lin: Difficult to find such a site. But the one in Singapore shows that it can be built. The bridge in Singapore is a very different, comparable structure. Although much smaller, it illustrated the point. Okay, now more questions.

The Doctrine of the Golden Mean: Optimization

Swent: You wanted to talk about optimization?

Lin: All right. I will start with my own youth education. When I was taught Chinese philosophy and classics. The most well known were the Chinese four books: *Da Shieh* (Big Learning), *Tsong Yung* (Optimization), Analect (Confucius), *Mun Tze* (Mencius), another. These are four books. Then there's the five classics. Of the four books, the second one is Optimization. Which the Western Chinese scholars translate as the Doctrine of the Golden Mean;

"mean" meaning average. I have a copy here, Doctrine of the Golden Mean, et cetera. These are the four books all in one volume with English translations.

Now, when I was young I was taught to read those books. To memorize. Now, I was never able to memorize all, but I memorized some. Maybe 20 percent or whatever of the four books and the five classics.

Then when I grow older, I learned Western philosophy to a very small extent. But Western math I was familiar with, although I am by no means a mathematician. As I mentioned, that when I took exams to the Tsing Hua University, among about 2,000 applicants, I was the only one who solved a very difficult mathematical problem which the Tsing Hua professor told my older brother. I was born somewhat a mathematician but never went too deep into mathematics and changed into engineering, still related to mathematics.

Then of course I learned calculus which was initiated by Newton. In calculus there are two parts: differential calculus and integral calculus. In differential calculus, the first formula is dY/dX, the change in the Y direction with the X direction, $dY/dX=0$. That's one of the famous basic formulas.

When I studied that and then applied it to bridge design, I found out bridge design was very much based on that formula. Take the overall bridge, say East Bay Bridge, you have supporting columns, you have deck on top. The total cost of the bridge is made up of the supports plus the deck. If you put the columns very close together you need many more columns but the deck will be cheaper, because the deck will be supported on closer piers. If you put the supports far apart, like the Golden Gate, the supports will cost less, but the cables will cost more.

The best design usually is when the sum of the two is at minimum--the deck cost and the support cost added together to be a minimum. And this minimum I define it as optimum. This curve was not initiated by me, in bridge engineering this is well known but I learned it. The cost of bridge support would increase from a small number of supports going up to many supports. When you have short spans, there will be many piers. When you have many piers the cost will go here. When you have few piers, the cost will go down. But the deck is less expensive when you have closely spaced piers. On the Golden Gate you have two main piers far apart, and the deck becomes very costly. Generally, the cost sum of the piers and the deck is a curve like that. And here is the minimum which is the optimum. This is a well-known way of designing bridges. You achieve the optimum which in this case is the minimum cost, or the point of maximum efficiency.

Swent: Because we're doing this on a tape, we should say you're showing with your hand the minimum is a curve that goes down and up and the maximum is a curve that goes up and down.

Lin: Down and up, or up and down. Right. So Newton's theory indicates that that point of maximum or minimum is really the optimum. Now, the Doctrine of the Mean is not just the mean; it is optimization. In fact the first two sentences state that. But the American Chinese scholars didn't understand, even though they may understand Newton's law [laughs]. I did.

The Mean Is Newtonian Calculus

Lin: Now we start from one of the four books in Chinese. The second one, often translated as the *Doctrine of the Mean*: its first two opening sentences read, "Being without inclination to either side is called *Jung*, center. Admitting of no change is called *Yung*." That's a wrong translation.

See, the way I'll translate it, "If the slope is zero, you are reaching optimum. If the rate of change is zero, you are reaching an ideal optimum." These two sentences in Newton's definition say $dY/dX=0$. [laughs] Yes. dY/dX meaning the slope. The slope equals zero, and the rate of change equals zero. This is the fundamental of Newton's calculus.

How could they use that word "mean"? The translation is wrong. The slope is zero, is *Jung*, and the rate of the change means *Yung*. This is simple Newton calculus. But our Western scholars did not understand mathematics--. [laughs] So it's all wrong.

Then you go on. In a philosophical way the classic says, "For every one of your actions, you want to reach the optimum." So that the rate of change is zero and the slope is equal to zero. This is $dY/dX=0$, period! Then the classic expands from there on. The Chinese classic describes a philosophical approach to optimization.

The Newton approach is a mathematical one, expressed in numbers, but the Chinese did not. So the Chinese philosophical approach and the Newton approach to optimization are actually the same.

Writing a Book on the Philosophy of Optimization

Lin: I found this so interesting when applied to life. If you overdo something, it gives you trouble. If you don't do enough, it's not there. So optimum is somewhere in between. From then on, I developed this through politics, economics, human life, and even religions, and so forth. It's very interesting. So I began to write a book on that theory. However, I drafted only two or three chapters. Then the book consisting of some ten chapters is now almost completed by my colleague and co-author. He was here last week. We have been working on this for years.

Swent: Who is your co-author?

Lin: Philip Chow.

Swent: Oh, you have a big stack of manila folders with lots and lots of examples and--

Lin: See, this is almost a completed book. It is just a first draft, now being edited and revised.

Swent: Where does Philip Chow live?

Lin: Philip Chow lives in Orinda. Now just glance at this.

Swent: All right, this is *Dynamic Optimization*. Is that the title? Introduction: "Consideration of Non-Engineering Values".

Lin: So this book will probably be out next year.

Swent: "The Problems of Aging Democracy."

Lin: You see, democracy is now often carried too far in the USA. It is not an optimized situation. The Republicans and Democrats are fighting each other, more for gaining a stronger position than for optimization. For example, during the Clinton impeachment crisis and all of that.

Swent: And that's all done with the computer, with the word processor.

Lin: And this is "Optimization of Political Theories and Actions", for example; there's my draft.

Swent: And you did this on a typewriter?

Lin: Yes. Yes. I use a typewriter, not a computer, but my partner works on a computer. I only drafted two or three chapters. He did all the rest. He's very fast; just sits there and types with the computer.

Swent: "Political theories are devised or practiced to fit the prevailing winds of the times." And you apply it to politics and to economics and to life in general.

Lin: [laughs] Life in general, very, very interesting. Now we're trying to find a publisher. We should get a popular publisher, because this is for the public. Not just a big theory.

Swent: That's the trick, to find a publisher.

Lin: Yes. I think we'll find one.

Swent: "Whither Goes Democracy: Is America Passing Its Prime? The Price of Democratization. The Impact of Technological Advance." That's a critical issue, isn't it?

Lin: Yes. Yes. Now the question always comes up, "Has our technology advanced too far?" Is it doing us good or is it overdone? Look at what happened in Silicon Valley. Terrific! We need all this. But is that going to stop somewhere, or should it a little bit.

Swent: But you can't stop it, can you?

Lin: Cannot. You have to go ahead, I think. But you may need to optimize it.

Singapore and Optimization

Swent: You mentioned there you've got a section on the case of Singapore. What about Singapore? What do you feel about Singapore?

Lin: Singapore is a very good example. It's doing quite well. It understands a lot of the East and of the West.

Swent: It's the meeting place.

Lin: It's a very small country. Meanwhile, it's very well run. Lee Kwan Yu is very good.

Swent: It has had a very autocratic government.

Lin: You see, autocracy was needed when they got their independence. It was the optimum way to organize and to progress for that time.

Singapore would not be as well developed without Li's strong hand. But after you have attained wealth and education, people begin to ask, "We want more freedom." So there was nothing wrong with him except he should change a bit, dynamic optimization. But their young fellows simply say, "I want freedom, freedom." You take American freedom to Singapore, it would not yet work. The people are not American, but if they are able to optimize to meet the situation, they would get the right amount of freedom, democracy, and cooperation.

Swent: But as you say, Singapore is small, America is bigger, and China is--

Lin: Even bigger--

Swent: A thousand times bigger--

Lin: They all can apply the theory.

Swent: They can?

Lin: But being dynamic, each one should act at different stages of the game. China should not do like America, and Singapore should not do like China. They should optimize with the size, the time, and the people. That's the theory. The theory I think is absolutely correct but how to do is not easy. The theory of democracy is fine, freedom is fine, but control is always necessary; how much control and how much freedom will change with the time.

Swent: Are you still in talks with people, with influential people in China?

Lin: Yes. Yes.

Swent: How do you use your influence there?

Lin: I think recently, in the last two years, I've been meeting the leaders less frequently. I got Mr. Y.C. Yang to do the engineering part. In fact, other people are helping China too. They have an institute here, run by Chinese, called the 1990 Institute.

Swent: Here in this country?

Lin: Yes. Yes. And they have made many financial and other policy suggestions to China. Recently they made a proposal to completely reorganize the Bank of China. So they wrote a letter to the premier of China but the letter could not reach him. Since I am an honorary chairman of this institute, they asked me to help. I approached the premier and the premier got the message. The Institute president, Cheng Hang Sen, is now in China with two American consultants. Dr. Chen was a member of the Federal Reserve Bank in San Francisco. Now retired, so he knows these people. They are now visiting the premier in China, introducing complete reorganization of the Bank of China. I tried to open the door for them.

Swent: Oh, that's so important!

Lin: It's so important. Still it is not enough. China is very, very complicated.

Swent: Oh, yes. But you're in unique position.

Lin: Fortunately, they believe me. Surprise! In only one day I solved the problem!

Swent: How did you send the letter?

Lin: Well, it happens that one of my colleagues is in Beijing and she knows the premier's secretary so I faxed to her and she immediately called the secretary who talked to Premier Zhu and I got an answer in two days.

Swent: So it's thanks to the connections--

Lin: The connections--

Swent: And also the fax.

Lin: Yes. That's very important.

Swent: That little machine has been extremely important, hasn't it?

Lin: Yes. It's really an approach.

Lin Tung Yen China: Not the Same as Taiwan

Swent: We haven't really talked much about your firm, Lin Tung Yen China. You maintain an office here and an office in Hong Kong.

Lin: All right. All right, let's go to this one. In 1990, I relinquished my job in T.Y. Lin International and set up a new firm in San Francisco, called Lin Tung Yen China, with the intention of working in China. I thought the kind of good engineering I did here can be transferred to China. I also thought we were very successful in Taiwan, where we had built many bridges and buildings. We could do same thing in mainland China. But we worked for eight years with almost zero results. We only begin to discover that mainland China is quite different from Taiwan.

We were not getting anywhere at all. I did get the political entry through the top leaders. And I thought that could be useful as an entry to the engineering profession down below. I completely failed. Because, China is so big. Every province is equivalent to Taiwan. In Taiwan, myself and Y.C. Yang, had a direct approach to the then sort of premier there.

He's not really the premier but had the power; Lee Gou Tin is a very good man. So every job we got, he gave the orders to down below, this bridge must be designed by T.Y. Lin, so we got the job. And paid T.Y. Lin 2 percent more fees. I thought the same thing would happen in China. Because we also knew the premier and the president, but they had no power because China has, say, twenty-eight provinces and we did not reach the provincial level. So our connections with the top people became useless when we talked about engineering. We found out that in China if we are to go to down-below we would pay some money. We never paid the money; hence we could not easily get a job.

Swent: You said you paid 2 percent to the man in Taiwan?

Lin: No. No. No. That's not right. It was Taiwan premier who ordered people below to pay us 2 percent more than the usual. We didn't pay anything. So we were paid higher in Taiwan by order of the premier. See, we got 2 percent more which enabled us to do good work and probably saved them 20 percent on the job. The premier knows it and gives the order down below who obeyed. In mainland China they did not care. Zhu Rong Ji, the premier, had no power to really command. I still don't know how to do that. In Taiwan we succeeded without doing it because we know the premier. And here we know the premier. But the premier has no power to command the underlings.

Swent: So who is doing engineering and construction in China?

Lin: The local people! Most of the engineering work is done by local people. Not so good looking, and cost more money. But who cares; they built it. So I dug into the days when we built our railroad to California. We built it; we got the Chinese, Irish, and did it. There's all kinds of corruption probably. But the corruption here was done legally. Like the four railroad builders, Huntington, Mark Hopkins, and so forth, they had legal ways to do the job and got paid with mileages of land. The Chinese did not know how to do that. They did it in the illegal way because they didn't have a legal system.

Swent: We had a lot of extra land at that time, too.

Lin: Also. Oh, they had. China has land too. China likes to keep land. Why keep the land? Let the Americans come in and build up the land. It's in China. So the American makes some money; so what? Now, we had the answer to the Taiwan situation. Being small enough, with our acquaintance to the top, we did very well. And in China so far we're not successful. So the premier organized a conference. [long search for papers] I've got so much stuff. Anyway. I have a book. Oh, here! I have a book on optimization.

Swent: You were starting to say that the premier had organized a conference.

Lin: Yes. Yes. I have this book which I wrote for his conference in Beijing. Where did I put it? I had it here. Oh, yes! Here! Here.

Swent: All right. This is a picture; on the front is the Ruck-A-Chucky Bridge. Oh here, it's all in Chinese, so I can't read it. Yes. I think you had shown me. This is the talk that you sent in August for the conference.

Lin: Yes. That's right before that.

Swent: And you sent the speech by video?

Lin: Yes. Right.

Swent: What has the response been to that?

Lin: They gave a big conference and the premier summoned two representative from every province to attend the conference. About 100 people. But still we don't get anywhere.

Swent: You haven't gotten any response from that?

Lin: No. Y.C. Yang is trying to work on it.

Swent: These are such beautiful illustrations. [looking at brochure]

Lin: Look at this Yosemite Bridge. It's a very small bridge, but it's beautiful.

Swent: Oh, the Yosemite Bridge, yes! This is from 1992. The San Francisco *Chronicle*.

Lin: See that little bridge. A pedestrian walk bridge. Only 100 feet long, very small. But the way it's shown, is beautiful. It embodied lots of new techniques to make a small arch here. A small arch. Embodies good engineering. Which nobody can do it, you see. Yes. Beautiful. There's a virtue of doing things with limited money, to build a concrete arch here is flat, you see, the old Chinese arch go up like that; this is so flat, and the concrete will shrink; if this thing shrinks then it can collapse, so after I build it, I have to push it, put prestressed into the arch. It requires good techniques to do it.

Swent: And it has been built?

Lin: No! We proposed this here and the *Chronicle* published it here. You know, it looks bigger but really 100 feet.

Swent: Yes. Lovely!

Lin: [laughter] Isn't it beautiful, though? This was only a good idea; this was a proposal. They didn't have the money to do it. [laughs] This shows many of the good things that I've done.

Swent: Yes. Beautiful illustrations.

Lin: This is the Singapore Bridge, an idea of the Ruck-A-Chucky Bridge but much smaller. You know, hanging there. This was built. A single pier, and inclined outside. See the column is outside, and hang up the whole bridge like the Ruck-A-Chucky. This is in China, Hwang San, Yellow Mountain. That's built.

Swent: Well, I think you've answered all the questions that I had, T.Y.

##

Lin: Oh! How can we bridge from the Orient to the Occident? It's very interesting.

Swent: It's happening.

Lin: It's happening. So yesterday we had a meeting of directors, board of directors of the committee of 100, via telephone. And they told us, one of the members, their family contributed $1 million; there are lots of people with money now.

Swent: What is the Committee of 100?

Lin: One hundred top Chinese people in America, originally organized by I.M. Pei. So I serve on the board of directors and so we had a meeting. And they announced they just received a donation of a million bucks to develop Chinese art and culture. Because our committee has emphasized more on politics, et cetera. Now starting into art and culture. That's very good.

Swent: I think of your grandson who's part Chinese and part European. That's happening more and more.

Lin: It is happening more and more. Yes. More and more.

Swent: You can't any longer say that people are just from one culture or another.

Lin: No. You see the coming century is centered on the Pacific and Asians will play a very big part. We have got to understand more about China.

Swent: Absolutely.

Lin: Of course China is trying to understand more about us.

Swent: Just by sheer numbers, China will dominate.

Lin: You see, 1.2 billion, which is the sum of all Europe and all the USA plus Russia and Japan. All the developed countries total number 1.2 billion. And Chinese alone. But the Chinese are down here in all areas of development. In brains they are very good, as good as the Europeans. But education and industry are way below. I think by the end of the next century we'll come up quite far. And Europe has already reached this high state. Now my question is: is Europe optimized or should it go further? Take computers, for example: you cannot stop their development. The question is, how can it be used for the people?

You see, when we came here, we understood it very fast. Because previously I had two years of education here, went back to China so my work fitted into this country's environment. I organized a firm, everything the American way, I got people to help. Now in Taiwan, I knew the Taiwan situation and fit into it quite all right. It so happened that we knew the chiefs. I thought that's the same as mainland China.

Swent: It's just so big.

Lin: So big! It has at least one more layer. You come to the provincial level: each province as big as Taiwan! And to get a good provincial control, is not easy. You don't have so many good leaders. If province is rotten, what can you do?

Swent: China is so huge, and it's not just that it's little Americas, bigger and bigger and bigger, but when you get that size, it's exponential, the whole difference.

Lin: I have fitted in the American environment. I can deal with Americans with no problem. And Taiwan was just right size. I thought my actions there should apply to mainland China. But apparently NO! [laughter] Perchance my political views fit in, but engineering views different. I saw the country as going into modernization but slowly.

Swent: It will have to modernize.

Lin: Yes. It have to modernize. It will have to be slow. There is no way.

Swent: And maybe we do things too fast here.

Lin: You cannot do like that in China. It will take time. I wish America would understand that. The Committee of 100 is trying to get Americans to understand that but its power is very limited.

Swent: How long have you been working with the Committee of 100?

Lin: About ten years.

Swent: Is your Peace Foundation still doing anything?

Lin: No. I'm trying to dissolve that foundation; there is nothing they can do. Peace is there already [laughs]. The USA has joined Russia now.

Swent: We're not fighting Russia any more, not openly, anyhow.

Lin: Not openly. I think it's foolish for the USA to enter into another war either with Russia or with China. It would accomplish nothing, only make matters much worse. Only our internal politics have changed so much that we are using foreign policy as a party struggle. That's very bad. I think we should unite on foreign policy. You know, during Roosevelt days, America wanted isolation, America didn't want to fight Japan. Then Pearl Harbor ignited the whole thing. There was this story that Roosevelt purposely let that happen.

Swent: A lot of people thought that. I think there is a difference even in America too, that we on the West Coast here are much more

Pacific-oriented, naturally, and a lot of people in the East, in Washington and New York, where a lot of the political power still is, on the East Coast, they're much more Europe-oriented and not as much aware of the importance of Asia. Although that's changing a lot.

Lin: Although in Europe we still have those problems. Israel, Palestine, Arabia, even Ireland, you know.

Swent: Oh, yes! Belgium.

Lin: See, we can use some of the Chinese philosophy. China always believes in the world as one. But if it is under one control, we wouldn't like it. The world under one control? No. The world would be, if we organize the world as one, under maybe two hundred states, we would have the federal government and we would have the state government and then the county government and so forth. It may be done.

Swent: There is some movement towards that.

Lin: Well, look at United Nations.

Swent: Now it's trying to help in Indonesia.

Lin: It's very difficult. We know the Indonesian Premier, Habibi.

Swent: Oh, do you?

Lin: Because we were working on a bridge with him. He graduated from Berkeley. But yesterday's paper says he may have to step down. It's very complicated. Indonesia is so big!

Swent: Huge population.

Lin: Huge area. I think we have to understand that the world is different.

Swent: And I think the overseas Chinese are a big factor in Indonesia.

Lin: Somewhat, politically, and economically. When we were there--we went several times--we lived in the house of a Chinese who went there with no money at all and then was a multi-millionaire. I was concerned with the difference between local people and people like him. I hope he is all right, but the Chinese were not too aware. They go there and they get rich. Millionaire, billionaire. Did not do enough to help the local people.

That's about all, I think.

Swent: I think we have just come to the end. I don't like to have it end [laughter] and your work is just beginning. This has been the easy part.

Lin: So I have to look at it after you have transcribed it.

Swent: This has been the part that's fun; now the work begins.

Lin: Most of it will be yours.

Swent: You'll have some work, too.

Transcribed by Cheng Li, Shannon Page, and Emily Chang
Final Typed by Laura Gonzales and Vania Gulston

INTERVIEW WITH BEN C. GERWICK, JR.

Introducing Prestressed Concrete and Overcoming Opposition

[Date of Interview: September 20, 1999] ##

Swent: The purpose of our talk this morning is to get some background information from Ben Gerwick about his experiences and recollections of T.Y. Lin. You said that your relationships went back a long way.

Gerwick: Well, they did. They went back to about 1956 when we first got interested as a company, construction company, in prestressed concrete. And of course as we started in that field, we felt we needed some experienced and competent technical advice. And having heard that a Professor T.Y. Lin had started a small professional engineering practice in San Francisco, we went and engaged him to give us some advice in these early days about how to use prestressing effectively. That was the start of a very long friendship.

Swent: Do you recall how you knew about him?

Gerwick: No, I'm not sure--probably from some of the professional meetings in San Francisco.

Swent: And prestressed concrete at that time was a brand new concept?

Gerwick: It was a very new field, but there had been, as I had read at that time, an initial conference in Boston, Massachusetts, on the subject of prestressed concrete, so that I knew it existed. And I had read from time to time in engineering magazines that there were early tries they made to use this material. And also, as I say, then probably heard both through the news articles and from the professional meetings which were held in many societies, like the American Society of Engineers in San Francisco, that T.Y. Lin was engaged in it.

Swent: Was there resistance to using this new material?

Gerwick: [laughs] Well, very definitely. We had the building codes which didn't recognize it; we had the opposition of the steel industry;

we had the opposition of the Reinforced Concrete Institute, which at that time thought this was going to take away their business--of course it has greatly amplified it, but they didn't recognize that. We had the opposition of the American Concrete Institute, who wanted to have a research committee study it for another ten years.

Swent: How were you able to go ahead and use it, then?

Gerwick: Well, we ourselves were able because our company was engaged in a great deal of marine construction. We had up to that time manufactured our own conventionally reinforced concrete piling, so it was very easy for us to change over and manufacture prestressed concrete piling, and get that substituted. It didn't come under the building code and its superior performance was very obvious; it solved many, many problems, to the point that it dominates the industry today. But to extend that to other products--that was what we needed to do from a commercial point of view, and that was where we ran into the building code problems and basically our inability to do the technical designs at that time.

Swent: Were you actually building the prestressed concrete buildings? While you were using it in other buildings, you were manufacturing it?

Gerwick: Well, we were manufacturing it and using it. But the only place that we could use it initially was in something that wasn't covered by the building codes, so then of course we had to undertake a long program in development--which we did jointly with T.Y. Lin--in promoting it through technical meetings, from papers, from publicity. Of course we could do that as a commercial firm; we were free to engage in promotion of that nature.

And he was a great help to provide us--for example, one of the pieces of technical literature that we found extremely useful was a publication on the design which structural engineers could use. It was a four-page pamphlet and it was prepared technically by T.Y. Lin, but we then printed and published it and distributed it. And it became an instant hit--an introduction from us to the structural engineers--because they also recognized that this was a material of the future, but they lacked any guidelines to use in their own design practice. Here was a piece of technical information that was valid, credible, and useable, so that helped us tremendously.

Swent: We should get that little four-page pamphlet, if it's still around.

Gerwick: I think I have one some place. It was a four-page pamphlet and it was published in a green color which we adopted as the color of prestressed concrete. We were ahead of the green revolution.

Swent: People talk so much about technology transfer these days and how things get adopted, so this is a very interesting example.

Gerwick: Now, there was another thing which T.Y. introduced us to: there was a fledgeling organization called the Prestressed Concrete Institute, known as PCI, in Florida which had pioneered the development of some precast prestressed concrete roof slabs for small buildings, commercial buildings and schools, and was using it and was trying to promote it. And this organization had sent out literature saying they would like to expand nationwide. T.Y. got us involved in it and the institute did expand nationwide and today it, although it's headquartered in Chicago, is the dominant technical organization devoted to precast prestressed concrete. So that was one area he introduced us to.

We also set up a small organization which his company participated in called the Prestressed Concrete Manufacturer's Association of California. I don't know whether that's still alive or not, but it was just a small informal organization of people that started up about this time--1957, '56. That was the initial--

The Critical World Conference, 1957

Swent: That was the critical time?

Gerwick: The next event--I think of it as a very major step in getting the acceptance and recognition of prestressed concrete--was the idea that T.Y. conceived of having a world conference on prestressed concrete in San Francisco, which actually eventually happened in 1957. By the way, in my preceding remarks, I think I was off one year. I think you have to go back to '55 and the earlier years--not '56--but now in 1956 he conceived the idea of this world conference.

Now this was a very bold step. You've got to recognize that prestressed concrete wasn't recognized and wasn't accepted in the United States at all, and yet here he was planning a world conference and he was inviting all the leaders of Europe and Japan to come. And it was extremely successful. These great names in Europe which had been five to ten years ahead of us in this particular area all accepted. We couldn't believe the way in which we got attendance, even from Russia. It was one of the first times that Russians sent a delegation, and we had a great deal of trouble getting the State Department to permit this. They did, with a lot of restrictions. The Japanese sent substantial numbers of people. People came from China. So it was really a world conference. And I'm sure he has shown you a copy of a publication that came out of that.

Swent: Yes, I have seen that.

Gerwick: It was held at the Fairmont Hotel. It was done with great style. We didn't spare any costs. Our budget was based on something like 600 attending, and we actually had 1,200 attend, which is a big conference on something like this at that time. It gave a big worldwide impetus for prestressed concrete--and it certainly kicked it off for the United States.

Swent: Yes, and then led to that connection with the Soviet Union, too.

Gerwick: Well, then he did host this group--delegation--if I remember, of ten Russian engineers and they in turn issued an invitation to us to come the following year, 1958, to Russia. Several of us were able to accept. T.Y. and Margaret, of course, were there. And there was one other man and his wife--can't even remember her name--who was associated with the Prestressed Concrete Institute. Another one who went was Professor David Billington, who has just received a major recognition as an outstanding educator of engineering at Princeton. And of course Professor Boris Bresler here at Berkeley accepted. And my wife and I accepted, but she did not go. She did not go to Russia, so there were only two wives that went to Russia.

The group that went--we went. We were treated extremely well by the Russians, and we have always felt that that's what constituted the beginning of the break-up of the cold war! And I'll tell you more about that later. Now this deviates a little bit from T.Y. Lin.

Swent: Oh, that's all right. Please.

Gerwick: Those contacts have kept up to this day; for example, I had a very close friend, Professor Konstantin Michailov, with whom I still stay in contact, and what we have traced is that most of the times that we met—although we never talked politics; that was strictly against the rules--we did mention the idea that somehow or other, these relationships helped to bring this cold war to a close. [laughs] And this had more than the normal political effect because the older brother of Professor Konstantin Michailov--the older brother of my friend--Professor Victor

Michailov was a close personal friend of Khrushchev's and so all the contacts with Americans were reported to him. Films of U.S. prestressed concrete were shown, the technical literature was shown to him, and apparently he established a very thorough understanding of these relationships.

Swent: Well! '58 was the year after Sputnik. That was the height of tension between the two countries, wasn't it?

Gerwick: Oh, yes.

Swent: Or one of the heights. And Russia was quite advanced in their engineering at that time, were they?

Gerwick: At that time, their work in prestressed concrete was definitely advanced. It wasn't ahead of Europe but it was different; it was original and extremely well done. We had a lot of things to learn from them. I of course subsequently visited Russia several times, and one of the problems was that I remember particularly thinking in 1988 they were still doing the same things, still making the same research in the same research laboratory, many of the same people--all extremely aged and no young men. No advance at all. So that was the problem with Russia. It stood still for thirty years.

Fédération Internationale de la Précontrainte

Swent: But you're still in touch with people as a result of that first conference?

Gerwick: Yes, I still am. But back to T.Y.

As a result of that trip, we also attended the same month, another new organization that was being developed in Europe, which is called the Fédération Internationale de la Précontrainte --the initials are FIP. And that organization grew to become the true world organization--international organization--in the field of prestressed concrete.

Swent: And this was based in France, was it?

Gerwick: No, it was actually located--the headquarters, the secretariat--in England. And the conference we attended was in Berlin. The meeting was in Western Berlin, but we of course visited East Berlin, which we were able to do in those days.

Swent: Had the wall gone up?

Gerwick: No, the wall hadn't gone up, but it was still a very tight border. And T.Y. Lin was elected as a vice president. Every country that would become a member could have one vice president. T.Y. Lin was elected a member from the United States to represent our country. And he served in that category for I think four years.

Swent: I don't believe that he mentioned that to me. I'll have to ask him more about that.

Gerwick: I'm not sure to what extent he participated in that organization. I actually took over after that--1962, that year. And I know that he had preceded me on that. They had conferences every four years. We attended many of those conferences together--that is, Margaret and T.Y. and my first wife and myself.

Swent: Were these all held in European cities?

Gerwick: Yes, Europe dominated this. In fact, in Europe in those days, the word international meant inter-European. Nothing else existed outside of that. [laughter] In fact, many organizations wouldn't even accept a member outside of Europe. For example, the--well, there are a number of examples, but--

Swent: Go ahead--that's all right.

Gerwick: Well, it doesn't have much to do with T.Y. Lin.

Swent: That's all right.

Gerwick: But there was a parallel concrete association--parallel to the American Concrete Institute--which was called CEB--Comité Européen du Beton.

Swent: What was the last word?

Gerwick: Beton is French for concrete.

I guess it has finally accepted membership from the United States, but in those days the only thing we could persuade them to do is to accept associate membership because we were ruffians from the outside--barbarians. [laughter] So these conferences--of course when you are with someone for one or two weeks and see them both in the meetings and technical sessions and at the social functions, you form close friendships, and that's what we did.

Working with Lin on the Kuwait Harbor Facility

Gerwick: Just about the same time--'58--we had our only, that I know, major contract relationship with T.Y. Lin International, and our own company. We received the opportunity to construct a major harbor facility in Kuwait.

Kuwait in those days was a very remote country with no telephone, only occasional air service, and certainly a remote place. And to establish this major port, the Kuwaiti engineers, some of whom were Palestinian but hired by the government of Kuwait, had heard about the field of prestressed concrete. They knew that reinforced concrete disintegrated in the environment of Kuwait almost before the structure was built and so they wanted this new huge harbor facility--complete with wharves and buildings and so forth--they wanted it built with prestressed concrete. And our opportunity there was to say, yes, we could do it with prestressed concrete.

Now, in connection with the wharf design, we had some technical problems as to how the design the deck slabs, and so we engaged T.Y. Lin International to do that. And they came up with a very clever system which worked and was installed in 1959. You've got to remember that it is very well documented that the average life of concrete structures, prestressed or otherwise in the Kuwait environment--the head of the Arabian Gulf--is probably between fifteen and twenty years. It is very well documented. There are hundreds of docks and structures built before and since; that's all they would last before they would corrode and fall apart.

Swent: Is this in the water?

Gerwick: It's because it's near the water.

Swent: I see.

Gerwick: And the one project which is still there--this is, what's this, almost fifty years later, forty-five years later--is still standing intact as good as new. We've got pictures of deck slabs totally without any deterioration at all. Designed by T.Y. Lin with a very clever system that enabled us to do it. Of course we feel they were built right, too.

Swent: Well, of course. That is remarkable.

Gerwick: It is remarkable.

Swent: Yes, and this is the only one?

Gerwick: From that era.

Swent: Yes. So it was due to the material that it was made out of?

Gerwick: Well, yes, due to the control of the materials and control of the construction process. But that was intimately involved with the design. The design had to accommodate the use of materials in that way. And what we needed was full depth precast concrete members all of which could be produced under factory conditions rather than anything placed out there in the field, like we normally think of concrete as being placed. His design permitted the use of these full-deck precasting, which then led to our ability to construct it properly.

Swent: Did you make them here and ship them there?

Gerwick: No, we made them out there, set up a plant, but it was a controlled plant.

Swent: Was this copied any other place, then?

Gerwick: Well, yes. Subsequently it was copied in Israel. The port of Ashok is down there at the very tip, the upper end of the Red Sea. We weren't able to participate in that because at that time we had been so heavily involved in Arabia and the embargoes between the two countries were such that we couldn't work in both countries.

Swent: No.

Gerwick: But that design was copied. Subsequently modifications of that have been developed by others--including T.Y. Lin. [laughs] So it's not nearly the revolutionary thing today that it was then. But then it was new. And it worked.

Swent: Well, I must ask him more about that.

Gerwick: Yes.

Swent: I don't know how intimately he was involved.

Gerwick: I think he conceived the particular scheme. We had some difficulty with his firm at that time and in our engagements with him I always specified that he personally do or at least supervise the engineering work because we had some disagreements with some of his staff.

Swent: I guess that's often a problem, isn't it, when a firm grows.

Gerwick: In other words, we recognized his ability and wanted it.

Through the subsequent years, our social contacts, personal contacts continued, but the only times that we became professionally involved were very small assignments on prestressed concrete structures that we were building or for which we were manufacturing the components. We had had a major manufacturing plant, still in operation, in Petaluma, California. And many of these products were involved in buildings and of course, sometimes problems would arise. And when they exceeded our ability to solve in-house, we would ask his firm to look at them. And they did. But fortunately most of them were small problems and didn't involve major participation.

But later, as I told you earlier, as a result of our continued professional relationship, we often attended the same professional meetings on prestressed concrete, or civil engineering that involved prestressed concrete.

I remember coming home from one of those trips on an airplane with T.Y. sitting next to me. He said, "You know, at the university we still are interested in having you someday come over as a professor of our construction management program. We need someone with practical experience and we haven't been able to find anyone. And do you know anyone else?"

At that time I said, "Well, I'm pretty busy. I'm now involved in offshore construction and so forth." But I said, "It's still intriguing. Someday I would like to do that."

Well, following that and following several other similar representations from other professors here at Berkeley I did make that decision in 1971. And so I resigned from my construction involvement, which by that time had been taken over by a much larger international company and--

Swent: What company was that?

Gerwick: That was called Santa Fe International. They had bought our company along with several others to get involved in the offshore construction. And I went with that group and enjoyed it thoroughly for five very hectic years, at the end of which time I told my wife, Martelle, I'd like to come over here as a professor. And she said, "That would mean less travel," and I said, yes. But of course that wasn't true.

But at least the travel now was more controllable. In the construction business, you just went when your clients called, or when the project needed you. Well, back to T.Y. and his involvement: so in this role now as a professor, I did not have too much direct contact with T.Y. in any professional activities on campus, but I was involved in small consulting activities outside the university.

The Columbia River Bridge I-205

Gerwick: And one of those was on a bridge across the Columbia River in Oregon, east of the Portland airport: bridge I-205. And this was a major project. It was $100 million in those days, which probably would be $400 million today--well, at least that! At least $400 million today. And it was to be built all of steel construction. I was shown a design by the State of Oregon, who said that they were very concerned about the cost. And I said, this should be built in prestressed concrete. They said, "Oh, well, how would we do it?"

Well, I sketched up some ideas on how it might be done. They thought it was worth while enough to permit it as an alternative in their design. Well, the low bidders on the bridge selected the prestressed concrete alternative, and in turn engaged T.Y. Lin International to do the design, the detailed design, of that bridge superstructure. Which they did. Now, as a result, I was engaged by the State of Oregon directly and by their consultants, Sverdrup, to serve as a member of the technical advisory board.

But T.Y. was working for the contractors, so we had joint meetings once a month for maybe three days, either there or here, and saw the project through--which was a three-year project. It was about once a month as we went through. And there were--since it was the first of these major bridges in prestressed concrete in the United States--there were some minor problems with those technical details that had not been foreseen. Together we worked those out.

I have one wonderful picture of T.Y. and myself looking at one of the cracks in the concrete and sort of scratching our heads as to what the cause was, but we agreed, and that was successfully repaired. The bridge is of course still very much in operation as far as the interstate highway system.

Swent: It's interesting that the State of Oregon would come down here for their work; that they wouldn't do it--that they came to California.

Gerwick: Oh, well, in bridge engineering you go all around the world. The sources--even the steel design was being done in St. Louis. But the bridge construction itself is a very local activity, just as for the mining projects that you were involved with.

Swent: Right. I would think that there might be regulations though that they would have to do it in the state.

Gerwick: Oh, the small work is still very provincial. In other words, if you have something--a small activity in the City of Berkeley--why, you had better be in the Berkeley area. [laughs]

Swent: Right.

Gerwick: So, yes, there are some provincial restrictions. The Bay Area is somewhat restrictive. Oakland, Berkeley, San Francisco, and so on, but still, generally, big projects are open. Oftentimes it's wise to have a local affiliate.

Swent: Yes. So this was you said in 1970--early 1970s?

Gerwick: I think that was 1975 when that was--'75 to '78. And if you talk to him about I-205, he'll I'm sure tell you more about it.

Swent: Good; I'll ask him. So that was one time when you worked quite closely together.

Gerwick: So then while our business relationship wasn't always that close, our social friendship and professional relationship was. He called one day and said that he had had his invitation to--

A Trip to China in 1978 with a Political Objective

Gerwick: We would make a trip to China and this coincided with a very interesting development in the International Federation of Prestressing, so here we have two different objectives. He had been invited to go to China to give a series of lectures on prestressed concrete--that was 1978, or '77 when we heard of it, '78 when we went. And that they would like to have us go with him.

Swent: What was happening in the international federation?

Gerwick: In the international federation, and that's why I say there was this interaction, was the fact that China had pulled out of the organization in argument over the membership of Taiwan a few years earlier, or two years earlier, and made a big show of walking out of the meetings because of our refusal to expel Taiwan, "the bandits of Taiwan".

Our position, which I was able to get the European members of the organization to adopt, was that we were not a political organization, and that we would accept qualified organizations from any country. And in those countries where they wanted to have two different established organizations, we would accept two. We did that for Italy, for example. Italy had one from north Italy and one from south Italy and they wouldn't even talk to each other at home, but they both came and talked at FIP.

But in the case of China, they said, "No, there's not two Chinas, there's only one China," so I was directed to see what I could do to get the People's Republic of China to join back with FIP and to do so without agreeing to expel Taiwan.

At the time we made this trip, there was only one organization, one field, in which China participated in which Taiwan also participated and that was ping-pong.

Swent: Oh, yes.

Gerwick: But nothing else. There were no other cultural relationships. The Nixon trip was still six months off. We were asked, if everything worked out, to make a one-month trip and to give up to five lectures. We didn't realize that meant one lecture a day, sometimes two, all the days of the trip, [laughs] but anyhow, we said we would do this.

And T.Y. said that he wanted to take Margaret. She wanted to see her home, her family, which she hadn't seen for twenty years. But Margaret wouldn't go unless Martelle went because she was afraid that they could be treated as a foreign Chinese, which in those days was very low level in China, and treated badly. So Martelle agreed to go, and then they took their daughter Verna, so five of us went to Hong Kong and then went up into China through Guangzhou and finally up to Beijing.

And at Beijing--T.Y.--there was a big reception for him. I didn't know there were that many Lins in the world, but there were a couple of hundred of them, it seemed to me, that came in, including a number of prominent scientists. As you know, his family is very famous, and highly regarded in China and has a great many outstanding professional people both there and abroad.

And then subsequently went down to Shanghai and had a similar meeting with Margaret's family.

During that meeting we did not talk politics per se, but there was a great deal of discussion about the need for China to find a means to rejoin the worldwide community on many fronts. So we had daily meetings, usually early in the morning, with the Chinese representative—head--of their Federation of Prestressing in China and myself.

Swent: It's interesting that they had such a thing.

Gerwick: It obviously was very political--I could sense that going to the meetings. And I stood firm on this, day after day after day--that no, we weren't going to kick out Taiwan. There had to be some way to accommodate them. They had paid their dues. They were qualified as members. We were non-political but we still wanted People's Republic of China to join.

And to my great amazement they said no. And we of course explored many alternatives, but never got to any agreement until the final day, at which time I left the meeting and said, "Well, thank you, I've enjoyed the conversations, I understand your position, I hope you understand ours, but it is firm--I'm sorry that we weren't able to get together." And I was halfway out the door when they called me back and said, "Well, here is one suggestion." It was the same suggestion which we had kicked around for ten days, [laughs] but they accepted it, and so that led to their membership--and we were the first technical or professional organization to establish international contact without giving into their demands to eject Taiwan. So it led to something.

Swent: Indeed.

Gerwick: And meanwhile T.Y. was very effective in his meetings with the railroad institute. He was, as you I'm sure know, a railroad engineer when he was in China and the railroad engineering group was very anxious to get into prestressed concrete and to involve themselves with him.

Swent: I'm trying to think back to what--in 1978 China was still--

Gerwick: It was still under Mao Ze Dong.

Swent: Under Mao. I'm surprised that they even had a national federation of--

Gerwick: Oh, yes. In fact, what we found was that they were extremely well informed by reading all the Western journals.

Swent: Oh, really.

Gerwick: People at the universities and the people in the professional organizations, you know, the governmental bureaucratic organizations, they knew everything that had been written. What they were completely missing was any practical level--well, reference or cross fertilization between practice and theory. So they knew the theory perfectly, but they hadn't had any experience in actually applying it. And even today we find that the one difficulty they have in the international construction market is their lack of a true reference to costs, practicality, schedules. They were highly directed towards technology and technique per se.

Swent: But this was after they had this great movement to go back to the peasantry and manufacture in their back yards and so on--

Gerwick: Oh, this was still--it was just at the end of it. Just at the end of that Cultural Revolution. In fact, the president of one of the leading engineering universities--and I always get mixed up in these names--I think it's Ting Li University--the president had just returned from five years spent in hoeing ditches. He had been demoted from president, sent out to the fields for five years, away from his family; he had injured his back, he couldn't stand up. He was in a chair, and he couldn't stand up to greet us. He apologized, but otherwise, he had been suddenly put back a month before into his position as president.

Swent: That was so tragic, wasn't it? You were there at a very interesting time.

Gerwick: Oh, yes.

Swent: Yes. And that was a major breakthrough to get them to join the federation.

Gerwick: Well of course, as you know, T.Y. had kept that interchange up even to this day and has been somewhat responsible for the university's open policy and encouraging the interchange of engineers and of other students at the university here at Berkeley.

Swent: Well, he received this presidential award.

Gerwick: Oh, I forgot about--oh, about that matter, T.Y. during the cold war--he'll have to tell the year--got convinced that the thing to do was to build an international peace bridge across the Bering Straits.

The Bering Strait Bridge

Swent: Were you involved in that idea?

Gerwick: Yes, to a minor extent. It has to be in the 1980s, early eighties. I was involved in the Arctic at that time in the design and construction of structures for exploration of oil in the Arctic--in the Arctic Sea ice--so he got me involved in how he was going to design and build the piers which would be prefabricated and towed up to the Bering Straits and placed on the sea floor. They had to withstand the ice and then support the prestressed concrete girders which he was going to have manufactured--again, in warm-water ports--and installed across the fifty miles of straits. And of course this idea was probably very bright, but was totally impractical. There wasn't a road on either end, within a thousand miles of either end, and of course over impenetrable, or almost impenetrable, tundra and lakes and waterways. He didn't bother with those details.

It's been my experience--I've had the opportunity of knowing two or three geniuses in my life--that that's one of the secrets of their genius, is that they don't bother with the details or practical realities. They just see through to something that is a great idea and then other people will figure out how to make the little things happen and then put it all together. In this case he did. The idea of an international peace effort of course was very active in this and a major factor in the ending of the cold war, but--and reflected the fact that the desire for peace involved so many people here in the United States and Soviet Union.

So yes, he set up a foundation, so he had a tax-free organization help print the literature. There was contact, of course, with the Russians, who at that time tended to be very pragmatic about it. It was totally impractical and it was, but we did the best we could to help make it moderately feasible from a technical point of view. And so came up with some concepts and then they were printed, published, and circulated around the world and received a lot of attention worldwide.

Swent: I think it was on the cover of *Popular Mechanics* magazine.

Gerwick: Oh, yes. Yes, that sort of thing was--really picked up. And I know that--I can't remember just where in Italy, but some of the Italians got very, very excited about it.

Swent: Romantic idea. Kind of romantic.

Gerwick: [laughs] Yes, it was a romantic venture--something like going to the moon, which is, quote--and this is me speaking--"Obviously impractical."

Swent: But we did it.

Gerwick: [laughs] Yes. That was about his approach. "It may be impractical, but let's do it." In fact, that was his approach at the time of that presidential citation--was, "Let's spend the few billion dollars it takes to make the bridge, to stand as a symbol." And architects of course believe in symbols. It's unfortunate that engineers don't recognize the value of symbols in our society. There are a lot of wonderful symbols around the world and we need to have more of them.

Swent: Yes, I'm thinking of the Missouri-St. Louis arch.

Gerwick: The St. Louis arch is a very good example, and of course of great bridges: the Golden Gate Bridge. St. Peter's. That's a totally impractical building, in one way, and the size of it.

Swent: An engineering marvel?

Gerwick: Oh, yes. Well, that's not much of an engineering marvel, but architecturally it is. But yes, you see these wonderful monuments that have been built ahead of their time and how they have influenced our society.

Swent: That's right.

Gerwick: Now, any talk about T.Y. would be inadequate if we didn't mention two things that characterize T.Y. One is his vision, and I think that has been recognized, that he does think big thoughts out ahead of many of us. And then, to this he gives the enthusiasm. You think about him in an abstract way, and he is the most enthusiastic person, even today, about what can be done, what are possibilities. And I know mainly from him, know that's exactly the way he approached the development north of Shanghai--the development which is now a reality. He had the vision--

Swent: That's the Pudong development?

Gerwick: Yes, that. I'm sure others had thought of it. It wasn't exactly a unique idea, although what gave it such impetus in China was the fact that T.Y. had this enthusiasm about its possibilities and he conveyed that enthusiasm to others who then carried it out.

Swent: We haven't talked about that at all yet.

Gerwick: Well, I didn't have any direct contact other than just through T.Y.

Swent: But he is remarkably enthusiastic and other people have said how optimistic he is. He just doesn't see negatives at all.

Gerwick: He doesn't see the road blocks and the negative aspects and why it can't be done.

Swent: And that's a wonderful talent, isn't it?

Gerwick: Yes, it is.

Swent: There must have been times when things did go wrong.

Gerwick: Oh, surely. Let's take this I-205 Columbia River bridge. There were a lot of technical defects that had never occurred before--there had never been a prestressed concrete bridge built that big. In fact, portions of it--large aspects of it had never been done anyplace in the world, and so some of these new effects started showing up--with high prestress and multi-axial prestress problems that would have dismayed other people. They had to be fixed, but if they hadn't been overcome, they would have been big, big negative blocks towards use of prestressed concrete. His attitude was, let's fix them. I had the privilege of working with him on fixing them. He did fix them. The bridge is in fine shape today. He didn't let the little things stop him.

Swent: There must be times when things just cannot be fixed, though.

Gerwick: Well, I can't remember any case of something falling down that he worked with, and I can with some other engineers. I really don't remember any failure in a sense that it couldn't be fixed or remedied.

Swent: Really. Maybe that's why he's so great.

Gerwick: Well, I'll try and think of one, but I don't think I can. [laughter]

Swent: Well, maybe that's one of the secrets of his success, that things did work.

Gerwick: Well, he was a sound engineer. I'll go back to the Kuwait experience as a case in which--by the way, that was one of the first prestressed concrete wharves ever built anywhere in the world of that size. And it's still in the best condition of all of them. And he certainly participated in that. So, yes, it's hard to find something of his that didn't work and set a pattern.

I might mention one more thing on the Columbia River bridge, it was featured on the cover of many magazines as setting a pattern for the future. Well, that was true; today, that's the standard method of practice nationwide and worldwide. Now, it isn't all due to T.Y. Lin. No, there are some great French engineers who have gone beyond him, but this was still the first.

Swent: It was the first.

Gerwick: First big one.

T.Y. Lin's Vision for the Bay Bridge

Gerwick: Now of course his role on the Bay Bridge, I guess, would be the last thing that we should bring you up to date with. He certainly again approached it with the usual enthusiasm and positive approach that, "here's the answer." His suggestion, which he publicized through the *Chronicle*, of a single-pylon cable-stayed bridge has finally ended up as a single-pylon tied suspension bridge--a slightly different concept, but nevertheless, it certainly reflects some of this ideas. There were others at the same time recommending the single-pylon concept. So again, we are in a situation where you can't say that he was the only one that thought of it, but he was one that publicized it, was outspoken and open about it, enthusiastic, and "here's the way to go." And the design that is being prepared reflects some of his concepts.

Swent: I'm not clear on what finally--have they finally decided on the design?

Gerwick: Well, the bridge design is essentially complete.

Swent: I see.

Gerwick: Some of the specifications and contract documents have been prepared.

Swent: Have they decided where they're going to put it?

Gerwick: The decision has been made--the formal decision in accordance with the law and the rules that were set up by the legislature on how this would be handled, have been complied with. The City of San Francisco had signed off on it, originally, and then of course as we all know, Willie Brown changed his mind. We think he did that, though, possibly to bargain, but I don't know if this is the press or in the news. My own opinion is that I think he's using it for bargaining abilities with CalTrans on much of the other work that's involved--the peripheral work on Treasure Island and Yerba Buena island. Whatever it is, he's playing hard to get and it has delayed the bridge, and this is tragic to jeopardize the safety of the people for as long as they have. To extend it another year or two is very bad. However, the design is progressing as though things could actually be finalized and the job could be advertised for actual construction here [at the] beginning of 2000, so it's ready to go. And for some reason I can't understand, the papers and the public haven't been demanding that some action be taken, particularly after the Izmit earthquake in Turkey. Because that earthquake here would shake down the whole of the East Bay Bridge today. Many of the spans could collapse.

Swent: We were lucky last time that only one piece broke.

Gerwick: That's right. But oh, by the way, the bridge came very close to failure--major failure--in the last one. So they had the one span collapse, but many of the other spans moved within just a fraction of an inch of collapse, too.

Swent: We didn't hear that!

Gerwick: No, sometimes things don't get adequately reported.

Swent: No, that's right.

Gerwick: Well, that's about all I can tell you.

Swent: This has been very, very helpful. If there's anything else that you think of, you could let me know.

Gerwick: Well, of course if I think of anything else, I will.

Swent: It sounds like a long and wonderful relationship.

Transcribed by Amelia Archer
Final Typed by Shannon Page

INTERVIEW WITH MARK KETCHUM

Father, Milo Ketchum, Jr., Award-Winning Structural Engineer

[Date of Interview: September 29, 1999] ##

Swent: We talked the other day on the phone, and you told me that you were a T.A. [teaching assistant] for T. Y. Lin. Let's go back and get more of your history. Where were you born?

Ketchum: I was born in Denver, Colorado, in 1954.

Swent: And your father was also an engineer?

Ketchum: My father was an engineer. My father is still alive but not practicing any more. He's somewhat older than T. Y.

Swent: But they had kind of parallel careers.

Ketchum: They had some parallels in their careers, indeed, and they worked on similar sorts of projects over the years, although their careers have been somewhat different. My dad, Milo Ketchum, Jr. --born Milo Ketchum, Jr., but he hasn't used that term since his father died--was a practicing engineering in Colorado. Built up a big firm there that was a nationally-recognized firm that won a number of big awards for design excellence. It was one of the few firms that won combinations of awards at the top of their respective categories.

Grandfather Milo Ketchum, Sr., Engineering Educator, Author

Ketchum: His father, as well--he was Milo, Sr.--and he was mostly an educator and had been dean at the University of Colorado, University of Illinois, and wrote a number of books in the early days, engineering textbooks in the United States, and is still widely known. T. Y. told stories about using my grandfather's handbooks when he was a young engineer in China, building bridges.

My grandfather was a steel structures expert in the era before the design of steel structures was governed by building codes. Like, the American Institute of Steel Construction now has handbooks on how to design steel structures and technical requirements. Before the advent of AISC, these things were handled by various experts, and my grandfather was one of those people who had books on design of steel highway bridges and steel buildings and a structural engineer's handbook that was very widely used. And T. Y. told stories about having used it in his practice in the early years.

My grandfather, though, died in 1934, which was twenty years before I was born, so I never knew him. Obviously, from today's perspective, that's history. That's not current.

Then my dad followed in the same generic career, although his focus was quite different, and his practice focused on long-span concrete structures and thin-shell concrete roofs and prestressed concrete as well, but without the--he was a practitioner in Colorado, and his real reputation came from fruitful collaboration with architects. He did a number of very beautiful, handsome, well-known structures that won a number of awards.

And then I came along. It's a long story how I wound up following in the same footsteps, but it was not preordained. I had a lot of other interests and originally went to college to study music and then got interested in--had always been interested in mathematics and realized that nobody in the area where I was, was interested in music from the mathematical standpoint, the way I was, and engineering was closer to what I wanted to do.

The structures end of engineering was obviously one I had a lot of exposure to. I can't deny that. But--

Swent: In the foyer of Davis Hall there are some buildings--

Ketchum: There are some photographs.

Swent: --and one of those was from Ketchum. I assumed it was you, but--

Ketchum: No, that picture is my dad's structure.

Swent: That's your father's structure.

Ketchum: I believe it's the St. Louis Planetarium?

Swent: McDowell Planetarium in St. Louis; Ketchum, Kunkle, and Austin. And that was your father's.

Ketchum: That's my father's firm, although they have the name of the firm slightly wrong. The Ketchum and Kunkle part was correct, but over the years there were various other people attached to the end of Ketchum and Kunkle, and it was never Ketchum and Kunkle and Austin, although Austin was there. He was part of the firm name that was Ketchum, Kunkle, Merritt, Nichol, and Austin.

Building Models of a Space-Frame Roof as a Boy

Swent: I assumed that it was you. Well, in a sense, it was you.

Ketchum: It really was something that my dad designed that--I remember when he did it. I remember when I was a kid he was designing the Corrigan convention center, Corrigan Hall in Denver, Colorado, which was at the time--this would have been the early sixties--it was the largest, longest-span steel space-frame building roof in the United States or maybe the world. It was lifted in a single piece. Covers two or three city blocks in downtown Denver.

My brother and I built models of it to work out the geometry of how it went together, and we worked from careful supervision from my dad of building this model, and I didn't really know what the model was for at the time, but now I do, and it was really to work out how to make the space-frame roof work correctly. In the intervening years there have been a number of collapses of big space-frame roofs that my dad was called on to investigate. They're a particularly intricate kind of structure that needs--in the early days of computer analysis, a number of them didn't work very well, and that was what our model was for, was to make sure that this thing was really stable.

But we built a model that was probably about as big as this dining room table, which is what?--four by six feet or something like that--out of ten-inch-long building sticks of various pyramidal shapes, stacked in different ways. It was contributing to that effort, and we visited construction sites and learned a lot about engineering from that.

Swent: When you came to engineering--

Ketchum: I finally came to engineering and was looking at graduate schools--

Swent: Where had you done your undergraduate work?

Ketchum: I started doing my undergraduate work at Bucknell University in Pennsylvania and then moved from there, halfway through, to Worcester Polytechnic [Institute] in Massachusetts, which is a small undergraduate institution in central Massachusetts, and got my bachelor's degree there. My mom had been a very strong believer in small undergraduate schools, and not going to big institutions like this one. And I was completely under her spell on that, and I understand why. I think I would have been lost at Berkeley as an undergraduate.

I was born in Colorado, but I really grew up in a small town in Connecticut called Old Saybrook, Connecticut, where I moved when I was eight years old. My dad opened an East Coast branch of the office in the early sixties, and we moved out there at that time. So I really grew up in this town that had a summertime--there was a summer community on the beach on the Connecticut shoreline. The wintertime population was five to eight thousand, and the summertime population was twenty or thirty thousand. It was kind of a beach resort community serving the folks from New York and, to a lesser extent, Boston.

We used to say that Old Saybrook was halfway between Boston and New York, and I think there was about a difference of five miles either way. We were talking about a hundred miles one way and a hundred and five the other direction. With new freeways since then, it's probably different now, but that's where I grew up, in a small-town environment.

I look at my experience at Berkeley, which was remarkable. But I would have been lost here as an undergraduate.

Choosing Berkeley for Graduate Study, 1975

Swent: How did you happen to come to Berkeley?

Ketchum: Well, I finished my undergraduate education, and thought I might want to go to graduate school, and I wanted to--

Swent: This was in the seventies, late seventies?

Ketchum: This is mid-seventies. I had gotten my bachelor's degree in '75 and came to Berkeley in the fall of 1975. I wanted to go to graduate school, and I wanted to go someplace that was top-notch, and I thought that there were really two or three schools that interested me. One was Berkeley, one was the University of Illinois, and the third was the University of Colorado. So I applied to all three schools and thought, Well, if I get in, then I'll think about whether I'm actually going to go. Then I was accepted at all three, and then my next thought was, Well, if I get any financial support from any of them, then I'll figure out whether I'm going. And then I got financial offers from all three. And I decided I really liked Berkeley.

The University of Illinois is where my grandfather had been dean and where my dad got his degree. Although at the time it and UC Berkeley in civil engineering were the two top-ranked schools, with Berkeley being on top, I decided I'd rather go to Berkeley, largely because of the physical environment here and living in California. After a consultation with my dad I thought the best faculty were here.

Also, just getting out of the family history at Illinois, I decided I'd rather go someplace else. And Colorado--I had grown up in Colorado, so really what brought me to Berkeley was the kind of leading faculty here.

T. Y. Lin, Professor Most in the Public Eye

Swent: Who were some of them that were here?

Ketchum: Well, T. Y. was one of them. He was certainly one who was in the public eye more than anybody else.

Swent: He was already well known?

Ketchum: Oh, that was almost the end--I mean, he retired from his time on faculty at Berkeley in what?--1977 was when they had the big seminar for him that was called "Past, Present and Future of Prestressed Concrete." They had a big to-do for him up there when he retired. And as a student, I helped with the coordination of that. I didn't get acknowledged anywhere, but that wasn't the point. So T. Y. was certainly one of the best-known faculty. He's one of the only ones who gets his stuff on the cover of *Popular Mechanics*, you know. The other faculty, although they made more scientific contributions than he did, he made more of the engineering, public-eye type contributions with his Bering Strait bridge and his work on prestressed concrete and big long-span roofs. He was very much in the public eye. And I guess he was on faculty from what?--roughly 1950 to roughly 1977.

Swent: The conference that I am aware of--I don't have my time chart here, but there was a big conference in San Francisco in '57 on prestressed concrete, an international symposium.

Ketchum: Yes, there was one that I was talking about that was here on campus. It was in honor of T. Y. There's a journal of the Prestressed Concrete Institute that's dedicated to all the papers on that. My copy of it, I'm sure, is at work. It's not here. But it has T. Y.'s picture on the cover with the Campanile in the background. And there were people talking about bridges. Ben Gerwick talked. There were people talking about nuclear power structures; there were people talking about buildings. Al Yee from Hawaii, who was another group of great engineers--had a very prominent practice in Hawaii. He designed a lot of those big hotels that were prestressed concrete hotels in Hawaii and was a well-known engineer. Another one that I've met through my dad in years past who is a Yale graduate, who gave a talk on building structures and prestressed concrete. This whole issue of the *Prestressed Concrete Institute Journal*. There were two institutes that I get confused sometimes. Prestressed Concrete Institute--that's PCI--and Post Tensioning Institute--that's PTI. I believe this one is PCI. But it was 1977, and the journal--the whole issue was dedicated to T. Y. So he was very much prominent by then. When I got there, there were two years left of his tenure at Berkeley.

Breadth as Well as Depth in the Faculty: The Golden Era

Ketchum: The other well-known faculty, the ones that jump out--one thing that Berkeley had to offer then and what brought me here is breadth as well as depth, so there were structural theorists, there were structural dynamicists, there were structural earthquake engineering people, more broad-scoped in that. There were those who I would call very much mathematicians with respect to the engineering.

But the ones who I knew ahead of time were Professor Scordelis, who wound up being my research supervisor, and Professor Clough, who was--oh, I regularly say he's the best instructor I ever had--not to denigrate anybody else, including Professor Scordelis, who was similar. But Clough--he's a guy whose research field has varied greatly over the years, but he's best known--he's best credited--with being the inventor of the finite element method, which is an analysis tool that is the standard method of analysis that he did some of the very early work in, in the early 1950s. He, of course, always credits other people who did work on it before him, and that's the way it should be, but he's certainly one of the early researchers in that field.

Professor Bertero, who was an earthquake engineering person, one of probably the broadest background I know of in that area. And then the continuum mechanics people like Professor Pister, who became dean later, and Professor Sackman and Lubliner, who worked over my head in terms of mathematics.

I'm just giving a sampling. And that's just instructors. The structures people had an incredible breadth. And the very practical people, from, like, T. Y. Lin and Professor Rayfield, who was very much a design-oriented person, to crossover people who were very strong theoretically but also had a deep rooting in practice, like Scordelis and Clough, to people who were very much computer-tools-oriented, like Professor Wilson, and--just picking one or two of each--to the very much theoretically oriented: Professor Kelly and Professor Pister and farther on with Professor Lubliner and Sackman and so forth.

And then in geotechnical engineering, the foundation engineering end of it, there was a similar breadth. So that was, I think, near the plateau, peak, of what would be called the golden era of civil-structural engineering at Berkeley. I think there were a lot of faculty members who were hired in the post-World War II boom at the university. A lot of those people came in in the late forties and early fifties and up through the early sixties, the way T. Y. did, and almost none of them had retired yet. In later years, the more senior faculty started retiring, like T. Y. did, and at this point it's all a new crowd. Again a very astute, very great faculty, but that group that really made the reputation for the university were all there.

Teaching Assistant for Lin's Class on Long-Span Systems

Ketchum: T. Y. was--something I didn't know about him at the time was that although his reputation was largely in conceptual design structures and these big thinking projects, like the Bering Strait Bridge and like the long-span shell roofs that he'd done, and his reputation for understanding the behavior of structures and designing on the basis of behavior and load balancing method and so forth--that was all very much backed up by an incredible depth in theory of structures. And what I didn't know about him at the time was that his graduate work at Berkeley, when he was--I'm sure you've been through this in the previous interviews--that he came from China to go to graduate school at Berkeley at about the same age that I was when I got there. I understand that he was one of the earliest Chinese graduate student instructors at Berkeley, if not the earliest. But that's a matter of record that you can look up.

But his graduate work was really in theory of structures, in that he made some very, very important contributions to theory of structures that gave him the background and the wherewithal to be able to do this conceptual thinking that later became more of the backbone for his reputation, to the point where now the theoretical contributions that he made in the thirties have largely been assimilated into engineering practice and no longer really associated with him, and maybe for some various reasons they were never associated with him, but they were still the tools that we learned in pre-computer eras. He has eclipsed that and is really known for completely other things.

Swent: Did you actually take--

Ketchum: I took classes from him, and I taught classes with him. My financial support in my master's program was being a teaching assistant, so I was accepted into the graduate program and I was offered a teaching assistantship, and the teaching assistants worked with a whole bunch of different faculty members; we were not assigned to a particular faculty member. Typically--this is twenty-five years ago, now, so the details might be a little hazy, but we'd be a T.A. for two or three classes each quarter. The university was on the quarter system, which means three quarters per academic year, and you [...] in the summer. Now it's on the semester system, and I never took classes on the semester system at Berkeley.

But we were T.A.s for two or three classes each quarter--

Swent: With different teachers?

Ketchum: --with different instructors on each one. And the first quarter I was there, I was teaching assistant for him in a class that was taught in the civil engineering department but the students were all architecture students. The civil engineering department structures faculty taught a year's worth of classes for graduate architecture students that were on structural engineering for architecture. And it didn't get into the nitty-gritty, nuts and bolts mathematical part of engineering; it was more on structural engineering so that architects could make intelligent designs and structures.

The first class was basic concepts of structural engineering, static equilibrium, strength components and loads and so forth, just the fundamental issues in engineering. The second class was on structural systems for tall buildings, and the third class was on structural systems for long-span systems. And T. Y. taught the long-span class. That was taught in the fall quarter, and I was his teaching assistant for that.

The other teaching assistant for that class--pops into my head as we speak--was a guy named John Magnuson. John Magnuson is now a main principal in a firm up in Seattle called Skilling, Ward, Magnuson, Barkshire. John Skilling is another one of those engineers that--he's not as quite as old as my dad--well, my dad is a few years older than T. Y.; T. Y. is a few years older than Skilling--but another one of those engineers who got started in the fifties and has done a lot of remarkable structures around the country. His firm designed the World Trade Center in New York City, which was the tallest building in the world when it was built. So anyway, Magnuson is there. I digress, I know.

Swent: Is there a connection with Senator Warren Magnuson?

Ketchum: I don't think so. It's a common Scandinavian name, and there are a lot of Scandinavians in the Seattle area. But John is another remarkable guy. He was one of the hardest workers, smartest students I knew then. But we hit it off very well, T. Y. and I, at that time. I was able to support his teaching efforts in the conceptual design of long-span roofs, and learned a lot from him about his approach to conceptual design. It's the kind of course that structural engineering students never take and yet it's a part of engineering, it's the conceptual design part, that is so important in getting structure right. No amount of analysis and detailing makes up for the wrong structure. And therefore it's the person doing the conceptual design who is, to a great extent, responsible for the final success of the system. No amount of fancy detailing, fancy analysis, will make up for something that is conceptually wrong. That's, I think, a large part of the history of successful or unsuccessful engineering projects, is that the concept is right.

So that is a course that I was teaching assistant with him on, and then the next quarter I took his graduate course on prestressed concrete. If I can just interrupt for a second--

[tape interruption]

Lin's Teaching Method: Conceptual, Not Popular

Swent: I was going to say you might talk a little bit about T. Y.'s teaching technique and whether it was any different from other people's.

Ketchum: His teaching technique was very much different from other people's.

Swent: In what way?

Ketchum: Well, most of the instructors that I worked with in graduate school at Berkeley were teaching technology and science, with strong roots in practicing engineering. They would teach formulas and theory and basic mechanics and extending that through mathematical processes into theory of structures, dynamics, et cetera. T. Y. didn't do that. T. Y. taught from a more philosophical standpoint and a more conceptual standpoint. I don't really think that he ever wrote equations on the blackboard and explained things like that. He left that to the students and would more discuss general issues and get more heavily involved in the background of how to think about these things from the design of prestressed concrete and post-tensioned concrete, because he I believe recognized that that was a very important part of engineering that others weren't teaching.

So a lot of students didn't really have a lot of respect for his mode of teaching. I don't know if he listens to these tapes or whoever else will, but he was not highly regarded by the students as being a great teacher, largely because, I think, you didn't wind up with a whole lot of technology in a notebook that you could then go study and apply to other problems. It was more that he would provide conceptual bases for how to design various types of prestressed concrete.

Of course, the topic of the course was prestressed concrete. He also at other times, not with me, but had taught other design-oriented courses as well--but always he would discuss problems and issues and ways to resolve those issues and not focus so much on the precise nature of the exact solution to those issues, because that took creative thought. So he was very much centered on creativity engineering and how to design systems rather than components. In reinforced concrete design classes that were taught, in steel design classes, the focus was on components and details. His focus was more on systems and the like.

Swent: I'm thinking that this seems to me the opposite of the stereotype that we have. He had this classical Chinese education, which involved memorizing hundreds of pages of classical literature, and we often think of the stereotype of the Asian, who can memorize and copy but can't do creative things.

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Ketchum: He was the opposite of that, in my experience. He was very much teaching creative issues, and he wouldn't--

Swent: Can you give me a specific kind of example? You see, I don't know enough about it, but it seems to me that, for instance, to solve a construction problem, don't you have to just get into the nuts and bolts?

Ketchum: We do, and we did get involved in nuts and bolts and details. To a great extent, he would assign reading both from textbooks and at the library in research papers that we were supposed to read and digest in order to understand the technological issues. But then, in the lectures, he would talk more about the philosophical issues and what all the stuff meant.

The typical analysis class or theory class or even a design class on--the classic case of design of reinforced concrete structures, where the instructor would get into the nitty-gritty of the behavior of a concrete beam or a column or a cross-section under incrementing loads and would look at mathematical characterization of that and the details--you know, all over the blackboard or from printed notes that would get handed out--would get involved even on a design class, much less an analysis class, where you'd get differential equations on the board and look at how to assemble those and solve those and come up with a response of a structure under certain inputs.

Even in a design class there was more behavior components and mathematical characterization of the behavior of those components and how things would--you know, under increasing load, it would soften and crack or yield and buckle and so forth, and the mathematical characterization which the other design teachers would go through in great detail on the blackboard, he would rely on us to read the source material, which most of us did [laughs] --not everybody--but then in the lectures and in the discussions he would talk more about how to apply those and what that meant with respect to the conceptual issues, and how you would apply these research results--which wind up being in the textbooks and in the research papers, and to a great extent in the building codes and in the design code--how to apply those and interpret them when you're designing a real structure.

So our design problems were typically not to design a cross-section to take this bending load or to design a beam to take this load or so forth, but to design a whole bridge and to figure out how to apply all of these things to a real structure and to conceptualize the design. Again, this is twenty-five years ago, more than half my life ago, so I'll have to dig a little bit to get specific examples, but one that pops to mind is: we were talking about design of prestressed concrete components to resist shear forces. Shear is a transverse force in a beam--I mean, in a column or a slab as well, but in a beam it is one of the components of force that resists the loads, and concrete--and prestressed concrete in general--is a highly non-linear response to the shear forces.

There's been huge amounts of research done over the past thirty or forty years--back then probably twenty years--on the response and design of components for shear. And the equations and the design codes in the textbooks have lots of terms for them, for assigning capacity to the concrete and assigning capacity to the steel that's embedded in the concrete, how much increase in capacity you get due to the post-tensioning or prestressing that's in the beam, and how this all adds up, and the fallacies in the equations because certain aspects of the equations imply that the cracks are forty-five degrees but in reality the cracks aren't there, but why can we assume that they are, and then pulling apart these equations and showing that in the end, if you--after going through this in a lecture, as I recall one whole lecture, although it could have been more or less than that--getting down to the end and seeing that all the equation really meant was that shear equals shear.

The real problem then was interpreting this equation and applying it to a real structure because the equation as it was developed really applied to a little beam in a building or in a lab test, and you were going to be asked to apply it to this big box-girder bridge. This then came up later, when I was practicing engineering, in my first tenure in practice at T. Y. Lin International, between 1977 and 1981, when I went back to school, because I started graduate school in Berkeley in '75 and got my master's degree in really the winter of '76, but the degree is dated '77 because they don't give degrees in December, or didn't.

Then went and worked for T. Y. Lin International until '81, and in that period we were designing segmental bridges, and there was a project we had where we did conceptual and preliminary design on a big bridge across the Columbia River, in Richland, Washington, for the Washington Department of Transportation.

Swent: That was the I-205?

Ketchum: No, this was another one. I-205 we did. We redesigned that bridge for the contractor. Another engineering firm had done a design that the contractor thought, with input from T. Y. Lin International, felt that they could make a more economical and equal-value structure. I-205 was in Portland, Oregon, as I recall. This was State Route 182, which was in Richland, Washington, which is way up river; it's in eastern Washington, on the "dry side," they call it, not the wet side--and in Washington, not in Oregon.

It was a bridge that largely had been forgotten at T. Y. Lin International. When I got back to the firm in 1988, I guess it was--is that right?--after I finished my degree and I worked for another company for a while--I found that the marketing folks had largely forgotten about this bridge because the final design was not done by T. Y. Lin International; it was done by the State of Washington Department of Transportation, with us as consultants to provide guidance on segmental bridges. The State of Washington DOT had never designed a segmental bridge before. They wanted to design a state bridge instead of letting it out to consultants, but they wanted a consultant to, so to speak, hold their hand and provide the guidance that they needed.

The issue of designing for the shear in this big box-girder came up. By then I had been involved in a number of these big segmental box-girders, and it became obvious that there was no equation in any code or in any textbook or any research report that provided adequate guidance for how to design these components of the bridge. And you could look at it one way that you knew had certain theoretical deficiencies and come up with one check on the design. You could look at it another way, which had another theoretical deficiency, and design it from that perspective. And you could look at it from a third way, that had another theoretical deficiency, and look at it that way.

But there was no way to look at it that got rid of all those deficiencies and came up with a final check on the design. You had to look at it these three different ways, each of which was deficient, and then use your judgment to come to a conclusion about what you were actually going to build--or draw, as the case may be. We didn't build the bridges; we drew the plans for the bridges sometimes. But still it was deciding what was going to be built.

And that was something that even today I find engineers have a hard time--not all engineers, but many have a hard time when there is no equation that adequately takes into account what's happening in reality. Instead, you need to look at it from three or four or more or fewer different, varying viewpoints, all of which--in total, they take into account all the issues that are going on, but no single approach takes into account all the issues.

And he really looked at things from that perspective. This was the kind of thing that he focused on, which was not the typical lecture approach of the other faculty members, where you were provided with strong theoretical tools for analysis or for designing something. This was a more philosophical approach, an introduction to the role of judgment in engineering. And so it was not a favorite class. It was not a class where you would go and busily take notes all lecture and then have something very quantifiable at the end of the class. Instead, it was something where your notes were not that concrete, so to speak, but there was more of an introduction to the philosophy.

Now, there were other faculty members at the university who took it upon themselves to teach these proximate methods and philosophical issues. Not all of them got along. One who comes to mind immediately is Professor Baron, Frank Baron. He died a few years ago. He was another fellow whose early contributions and early research were highly theoretical but then got to the university and after a number of years of varying research and teaching interests, realized that nobody else was teaching the proximate method, so by the time I got there, he was known for his courses on graphical methods on analysis, where you never make a single calculation; you do everything by drawing and figure out how a structure is going to behave by graphical methods.

Graphical methods of structural analysis were considered very heavily, for instance, in my granddad's handbook because back then people couldn't do calculations that we can do today, while today graphical methods of analysis are largely forgotten because the computers are so powerful you can throw everything into a structural analysis program and get all the numbers out. That doesn't mean that they're any more accurate, because there are issues of accuracy versus precision, and accuracy and precision are not the same thing at all. You can be very precise and have all your answers down to ten significant digits but not be very accurate if you're not modeling really how things perform.

T. Y. and Professor Baron were both teaching those more philosophical aspects rather than just the science and technology--not to say that the others weren't. The notes that I have and the things that have led me to some of the capabilities that I have in my current practice are very much the quantitative issues, but the professional issues and the conceptual design issues are what he focused on.

Then I took that class from him and went on and worked with a number of other faculty members and got to know Professor Scordelis very well. Did a master's-level research study with Scordelis, who was a great collaborator of T. Y.'s in many of T. Y.'s better-known engineering projects. And then knew that I wanted to go out into the practice of engineering after the master's degree. Although I was interested in further graduate study, I didn't want to do that right away without going out into the practicing world of real engineering beforehand.

T. Y. basically recruited me out of the halls.

Working at T.Y. Lin International, 1977 to 1981

Swent: How did this come about?

Ketchum: Well, again, my recollection isn't crystal clear, but he certainly knew that my interest was in the practice of engineering and so forth, and I probably expressed an interest to him of working for him, although I don't remember this in detail. Oh, in his class I had been the top student in his class, as I recall. There were two of us who "aced" the class, so to speak, and did very well. And he approached me after that, knowing full well that I was looking for a professional--you know, outside-the-university job at that point and for all intents and purposes offered me a job at his firm, although the formal offer came after an interview with the staff over in San Francisco.

The principal staff at the time were his partners, Y. C. Yang and Felix Kulka. You've probably spoken to Y. C.

Swent: No, I've not yet talked to him, but I know the name very well.

Ketchum: Felix and Y. C. really ran that office for many years because T. Y. started his engineering practice while he was a faculty member, and that was generally frowned upon among university folks, but T. Y. did a number of things right, either by design or by accident--I wasn't around at the time, but the early years of his practice, the practice was in southern California, so there was no question that he was really doing his work at the university, because he was there and he would consult with them.

In the later years it was a small practice in San Francisco, and Felix and Y. C. really ran the place. Felix was Caucasian, like myself. He was a Czechoslovakian immigrant, as I recall, and a concentration camp survivor or certainly a World War II persecution survivor. I believe that he and his mother, maybe his father as well, escaped on a small boat from the Nazis and came over here, and he went to graduate school. Whether it was at Berkeley--I'm a little hazy on this. But then he hooked up with T. Y. and started the firm, and then later Y. C. joined up, and then it was T. Y. and Associates and then, after it became a three-way partnership, they were really running the office, and T. Y. was full-time at the university and consulting with them.

Then, when T. Y. retired in 1977, he went to work there full time. T. Y. was the philosophical leader of the firm. I think that Y. C. and Felix shared the running of the office. As a junior at the time, I wasn't entirely clear on what exactly each one of their roles were, but I think the flavor of the office, the ambiance, so to speak, of the office and the experience of working there had a lot to do with Felix.

Felix was a wonderful guy. I remember my first or second week there he came and talked to me. He knew that I was one of the folks that T. Y. had routed to the firm, and there were a number of good staff that they had over the years who had gotten there by the same path. He asked me if I knew how to sail. As a matter of fact, I'd sailed boats since I was a kid on Long Island Sound. He said he had this boat, and if he could check me out it, then I could take it out whenever I wanted to. That was a perk that I hadn't counted on!

But I'm digressing again here. That was really the beginning of a great growth era for T. Y. Lin International, from the time that T. Y. left the university to work at the firm full time. I started there just about the same time he went back. And as I recall, I was the twenty-seventh--with me there, there were twenty-seven staff in the whole office. Now, there was also a Taiwan branch and a Hong Kong branch, which were largely independent. But the San Francisco office, which was the headquarters office--I brought the staff total there to twenty-seven. And as I also recall, there were seventeen countries represented--birthplaces of those twenty-seven folks who were there! [laughs] So it was a real international group.

Helping to Design the Ruck-a-Chucky Bridge

Ketchum: My first project there was what we called the most famous bridge never built, which was the Ruck-a-Chucky Bridge, curved cable-stayed, hanging-arc bridge associated with Auburn Dam in northern California.

Swent: You worked on that?

Ketchum: That was my first project. One of the reasons they brought me over, I think--although you never know why you're hired; you only know that you are hired and what you pictured yourself as--but part of my work at the university had been on the earthquake simulator lab out at Richmond Field Station. They were building a model of the bridge to be tested on the shaking table at the earthquake simulator lab.

My first involvement with the project was with that analysis and testing of that bridge. Resolved a number of problems on the bridge. I participated in the design, fresh out of college, a young engineer, and made certain contributions, but the design was really handled by--but, again, the philosophical aspects of the design were handled by T. Y. Certain technological contributions were made by Y. C. Yang and a number of other senior staff.

The production of the bridge was handled by Charles Redfield, who is another mentor type there. He was a very good engineer who wound up being head of the bridge department as the firm grew and who left in the late eighties and now has a basically one- or two-man practice designing bridges. And another man named H. K. Loo, who was a long-time employee of T. Y. Lin International, who was handling the production aspect of the bridge, and then a number of other design staff.

were interested in getting me out because they kind of rely on a certain degree of turnover.

Swent: When you went back for your doctorate, though, Lin had left.

Ketchum: He had left by then, yes.

Swent: You were with--

Ketchum: Scordelis. Professor Scordelis was my research supervisor, and I knew that before I went back. We had lined up some things. Worked on a number of projects with him, some of which were associated with my degree, some of which were not.

Swent: Were any of those associated with T. Y. Lin?

Ketchum: Well, they were all things that were true to T. Y.'s heart. My doctoral topic was oriented towards segmentally erected, prestressed concrete bridges, which T. Y. had helped pioneer in the United States. I was involved in some other research projects which slowed me down to a great extent in getting on with a doctoral topic. That's all another subject that's probably not germane to this one.

Swent: You had said you worked for another firm and then went back to Lin. I was wondering why you did that.

Ketchum: Well, I worked for a firm called Wiss, Janney, Elstner Associates. They're a Chicago-area firm that has a Bay Area branch office. Another professor who I had met back in the master's program and had retired about the same time T. Y. did, a guy named Boris Bresler, had started--they retired about the same time. Professor Bresler and T. Y. collaborated on a book as well, on *The Design of Steel Structures* by Bresler and Lin. There's another edition that was Bresler, Lin, and Scalzi.

But Bresler was another one of the old-timer professors at Berkeley, who was a design- and behavior-oriented guy. He retired about the same time T. Y. did--sorry, I'm losing track here--and opened up a branch office of the Northbrook, Illinois, firm, Wiss, Janney, in Emeryville. He had offered me--he had made me feel like I'd be welcomed there back when we saw each other regularly, and when I got out of my doctorate, I didn't really want to go right back to the same firm that I'd worked for before, because that seemed like that would be kind of negating some of the value of my new degree or something if I just went back to the same firm.

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Ketchum: We were talking about going back, after finishing my doctorate, realizing that an academic career was not what I wanted to do. I wanted to be in practice, practicing engineering. So I liked the idea of working in the East Bay, in San Francisco, and this firm was oriented towards investigations of structures. So I was there for about two years, I guess--not all that long, really. It turned out that the job there was not a good match for me, although I learned a lot and was involved in some very interesting and challenging projects, but the largely forensics end of engineering, where you're doing post mortems on structures that didn't work and working largely for lawyers and insurance companies, turned out to be not a good match for me.

So I left that firm and realized that the creative engineering, where you have a breadth of work from new design to evaluation and so forth and have that opportunity to do the creative part of engineering was more in line with what I wanted to do with myself.

Return to T.Y. Lin International; Evaluating the Golden Gate Bridge

Swent: When were you working on the Golden Gate Bridge?

Ketchum: I went back to T. Y. Lin International in 1988 or '89--I forget now--and worked on a number of projects and then a project came up that was a request for proposals from the Golden Gate Bridge District. That must have been in '89 that this request for qualifications and proposals came out, for looking at adding a rail system to the Golden Gate Bridge. The proposal was to look at just the structure, not the political implications and not the approaches to the bridge from the Presidio and from the Marin [County] side, but looking at the structural feasibility of adding one of several different alternative rail systems to the Golden Gate Bridge--outside--not just to convert highway lanes to rail, but adding outside of the highway alignment a rail system into the bridge.

Another fellow, a very senior staff member at T. Y. Lin International, was putting together a proposal. That was Chuck Siem, whose name you may have heard as well. He was putting together a proposal, and it turned out I was the only person in the office who had ever worked on a suspension bridge. One of my projects at Wiss, Janney, Elstner was rehabilitation of a modest-size suspension bridge, and I had done an analysis and dynamic analysis and so forth, non-linear analysis of a suspension bridge then, and was made a very large part of the proposal because fatigue was an issue with respect to trains on the Golden Gate Bridge, metal fatigue, and I had been the project manager on a big fatigue evaluation of the Benicia-Martinez Bridge for Wiss, Janney.

The analysis of a suspension bridge was a big issue, and I had done an analysis of a suspension bridge before. And wind was a big issue, and I had been involved in a wind evaluation of the Ruck-a-Chucky Bridge many years before. So Chuck Siem was designated as the leader of the project, but I was made kind of a senior staff engineer on it for that, and wrote a very large part of the technical proposal.

Then we got the job, and Y. C. Yang promoted me pretty much right away to be project manager because Y. C. felt Chuck's strengths as being other than actually running the day-to-day aspect of the project. Chuck was still the titular head of the project, but I was running it.

We did a very comprehensive evaluation and wound up on TV for the local TV news when we presented the findings of that. But what made that a much bigger project than we initially thought it was going to be was that about a week after we signed the contract and got our notice to proceed on the rail study--which looked at BART [Bay Area Rapid Transit] and light rail and a couple of other alternatives and wound up with a scheme putting a lower deck on the bridge for these two train tracks--about a week after we got started on it, the 1989 earthquake hit, and the Bay Bridge got knocked out of service and so forth, and we all remember that.

Our rail evaluation of the bridge had what I would call a modest seismic component. We had all of the technological skills on our team to do a full seismic evaluation of the bridge, but as part of this rail study it was a modest study, looking at what we felt were the most significant aspects of the seismic performance of the bridge. Well, both Dan Moen, who was the chief engineer of the Bridge District at the time, and the staff at T. Y. Lin International saw that with the troubles that the Bay Bridge experienced that it would behoove us to increase the scope of that seismic study on the Golden Gate.

So with a lot of direction from a lot of people, including Dan Moen from the District and Chuck Siem from T. Y. Lin

International and me as really the technologist there--Chuck Siem is probably retired now; I haven't kept in touch with him since I left eight years ago, but he was close to retirement then--and an engineer named J. P. Sing, who is a ground motion, geophysics, geotechnical expert--we put together what was later called the most comprehensive seismic evaluation of a major bridge ever performed.

I was the leader of that effort.

T. Y. Lin as Orchestrator

Swent: Did T. Y. have any input in it?

Ketchum: T. Y. had a lot of input into that. Again, he was a big-picture guy; he wanted to get a handle on--not making sure that we were looking at the nitty-gritty details precisely correctly but that we hadn't left out some big part of the picture. And that was a role that he frequently took up on many projects. He was an orchestrator of all the disciplines, where you would have a bunch of experts all together, trying to work on a project, and he would be the one who made sure they would all talk together and understand each other and that the fact that you have each expert looking at their thing leaves a lot of opportunities for holes in what gets evaluated. He was a master at listening, making sure that he understood enough of what these experts had to say--not questioning them about what they were undoubtedly a better expert at than he was, but making sure that everything fit together and there was no hole in the picture. That was his involvement on the seismic part of the Golden Gate Bridge.

On the design part of the Golden Gate Bridge, where we were looking at putting this rail deck underneath the bridge, he was very involved in the conceptual design part of that, in how to add this huge load onto the bridge and get through the design details of everything. In fact, it was only on a few occasions when in my experience that that wasn't T. Y.'s role. Typically, I would see him--both when I was a junior engineer up through a project engineer type staff in my first tenure there, and then as a senior engineer up through principal in my second tenure there --most of the time I would see him as an orchestrator, and I mean that in a complimentary way. He would orchestrate the project and make sure all the disciplines that were needed were there. He would be able to attract the best people in each of those disciplines and be able to talk to them intelligently about their discipline and show that he really understood what was going on, and then be able to coordinate them technically. The day-to-day management was typically left to others, but he'd be able to get all these people to talk together and solve the "real problems."

Lin and the Moscone Center Redesign: Sound Basis in Theory

Ketchum: It was a real shock to me on one of the occasions when I really saw him roll up his sleeves and do nitty-gritty technical analysis, and it almost blew me away when I saw this happen. It was on the Moscone Convention Center; on the design it was called the Yerba Buena Convention Center because it was renamed when Mayor Moscone was assassinated. But there was a design problem on that building, not with the main arches across the underground convention space, but some very technically complicated cast-in-place post-tensioned girders that formed the roof of the dining hall and also the floor of the main entrance lobby, where there's something like a 150- or 200-foot span girder that in the very middle of itself holds up the end of a 200-odd-foot span lobby roof truss.

And so, you know--well, it's a very sound structure, but it's clearly--your column coming in from above, where it holds up a huge long span, sits in the middle of another huge long span, and it's a very complicated shape. This had been designed by the normal design staff on the project, with oversight by all the normal oversight people. T. Y. was really the conceptual designer on the Moscone Center. And one of his senior engineers signed the drawings on it and this had gotten through all of that. The engineer who actually did the day-to-day supervision of the project was a fellow named Jeffrey Larson.

It had gotten through all of the normal review, and Y. C. Yang was looking at the shop drawings when it was under construction. And he saw the shop drawings, which are the drawings provided by the contractor that show absolutely every reinforcing bar and so forth that goes into it--the design drawings don't show every single bar; they talk about bars of six inches or something. He was reviewing the shop drawings and looked at the drawings for this exit-tunnel girder that I was just describing and immediately put a stop-work order on the construction. The contractor was ready to pour the concrete, and Y. C. shut down the job and said, "No, no. This is wrong."

Of course, no contractor likes that, and no owner likes that, because the contractor's shop drawings were in compliance with the design drawings, and that means that the owner has to pay for the delay on these things. Y. C. was convinced that the design was wrong and it would never even stand up. I was brought in and later redesigned this exit tunnel. It was a very funny design project. It was--

Swent: A very what?

Ketchum: I called it funny. It was a design project where normal analysis gave the wrong answer. And T. Y. actually--I wish I'd kept a copy of it, but I didn't--before I got involved, Y. C. went to T. Y. and said, "This is wrong." And T. Y. evidently basically agreed that it could be, and T. Y. did about a dozen pages of detailed calculations to determine what could possibly make the engineers think that this was right when Y. C. thought it was wrong. It was a dozen pages of very detailed engineering calculations that were the one time where I saw T. Y. do something other than orchestrate and so forth and the conceptual design part.

And that was when I realized that what gave T. Y. this ability to do the great conceptual design work is that he had an absolutely sound basis in theory. His ability to do theoretical analysis is incredibly strong--stronger, to a great extent, than the recent M.S.s and Ph.D.s they had designing the Moscone Center, because he caught what was the fundamental error right away and demonstrated how the error in analysis would lead the designer to believe that this design was right when indeed it was wrong, and this other one was right.

That's one of the things about prestressed concrete, is that it's active control and active strengthening of the structure rather than passive, and if you put the prestressing in the wrong place, or put in too much prestressing, it can actually break the structure--unlike a passive structure, where if you put in more rebar than you need or if you put in a wider flange on a wide-flange beam than you need and make it too strong, nothing can go wrong, while with prestressed concrete, if you put in too much steel or the equivalent beefing it up, it can actually break the structure.

So he zeroed right in on that, and it was basically at that point that I realized that--and this was in my first tenure at the firm--that one of the things that was a commonality amongst these really big-thinking engineers, people who are able to do independent thinking and great conceptual design, is that they had their theory down cold. And even though T. Y.'s reputation was for back-of-the-envelope designs, I think that was based on twenty or thirty years of absolutely solid theoretical training and background.

So anyway, we were talking about Golden Gate Bridge and what was his role on that. There was the conceptual part, and there was the making sure all the holes were plugged and so forth on that one. I digress.

Leaving the Lin Firm and Forming OPAC

Swent: That's fine. That's even better than the bridge!

So then you left the firm and formed your own. Have you ever been in competition with T. Y. Lin?

Ketchum: Sure have. A lot of times.

Swent: How did that work?

Ketchum: Well, you know, I have mixed emotions about dwelling on leaving his firm because I had some of the best engineering experiences of my career there. It was a remarkable firm to go work at.

Swent: Was he still there?

Ketchum: The second time I came back, he was still there, yes. He had sold out most of his stocks by that time and was not working full time, but he was still there all the time, and they were still down on the Bay Street address, and they hadn't sold the firm yet when I came back in '88, '89.

Oh, it was a remarkable experience going to work for that firm. It reminds me of going to work at the university. You get there, and there's all this stuff going on and you just have to leap on and be a part of it. I had remarkable opportunities and remarkable experiences there, working on the Golden Gate Bridge, the Ruck-a-Chucky Bridge, the segmental bridges, and getting a lot of responsibility early on if I could handle it, and doing pretty well at it.

But then after the sale, which frankly I had been introduced to the new owners before they bought the place, when it was still prospective; I was a senior on staff there, but I was introduced to them and asked my opinion on them, and they seemed like a good bunch of folks, but the new management that was brought in after the sale--without making any remarks about people--within the space of a year or two, I went from enjoying my job to not enjoying my job. [Before then] I'd get up early in the morning and go to work and be surprised that the day was over, and within that period [I was] dreading going to work in the morning. And that was wrong.

And there were a lot of people--some of the best folks were leaving at the time. We moved to the new office on Battery Street from the old office on Bay Street. The new office was very plush and very corporate oriented as compared to the old one, which was kind of a more friendly space--you know, much more friendly. You can do in a space what you need in order to get things done; it was not plush or anything.

The new management came, and the old owners were very much feeling alienated to the point where Y. C. left the firm in disputed terms. I don't know if there's a dispute about them any more, but he left, and memos from the new management came out about how this was the story we were supposed to tell the outside about how he left and so forth.

I was becoming more and more dissatisfied and basically decided to leave the firm and then talked with Kwong Cheng, who had been the head of the department I worked for. I was much more of a technical person than a project person. He was a guy who I'd known and met in my first tenure there. He had started at the firm about a year after I did. He had stayed there when I went back to school and became head of the bridge department by the time I came back and was a great leader of the department. He was a good manager and a good leader and a good engineer all around.

He had left too for--I won't put words in his mouth, but some of the same reasons that I did. We got together and decided that this would be a pretty good opportunity, that our strengths together potentially--the whole being greater than the sum of parts type of a collaboration. So we got together. At that time, T. Y. was still with the firm even then. Kwong left in December '91. The firm moved to Battery Street in July '91. It was sold in '89, I guess. We made the new move in July '91. Kwong left in December '91. I left in February of '92, which was the official incorporation date of our new firm.

T. Y. was still at the old firm at that point. He was still trying to make things work. He hadn't given up yet. He was a very much upbeat sort of a guy, and he thought that there was still something that could go on, I guess. Again, I don't know his thoughts, but I know his actions, and I know I talked to him a lot about leaving because we go way back, and he was one of the most important people there, and in my career.

So I talked to him about that, and he knew I was leaving. Kwong and I actually rented space from him while he was--he and Y. C. owned the old building that the firm moved out of on Bay Street, and so Kwong and I rented space from him to open our new office, so obviously there was some appreciation for what was going on at the time.

And then, oh, four or six months later, he quit as well. He resigned, and that hit the newspapers pretty well. He resigned the firm, rather than retiring. That was '92.

Swent: He was already eighty years old.

Ketchum: He was already eighty-something years old, and he didn't retire; he resigned.

Swent: [chuckles]

Ketchum: So we started the firm and had every intention of staying on good terms with T. Y. Lin International but, without going into the details, didn't. And lawyers got involved, and we got sued by them for unfair business practices. That kind of crossed the t's on that relationship! I'll tell you that. But then we continued with our practice. It left kind of a bad taste in my mouth because my intent was to stay on good terms. I had nothing against the people who wanted to stay; I just didn't want to be there any more.

But then our practices were parallel, and we have competed with them on a number of jobs, some of which we won, some of which they won.

Continuing Collaboration with T. Y. Lin as Consultant

Swent: You've also collaborated with T. Y.

Ketchum: We've collaborated with T. Y. And now it's hard. Now you have to get into semantics because you talk about T. Y. Lin, and are you talking about the firm or the man, right?

Swent: Yes.

Ketchum: We've collaborated a lot with Professor Lin, the man, right? We started to collaborate with T. Y. Lin International before--the very first months of business, but that got cut short when the lawyers got involved. I'm trying not to point fingers and just leave that one where it is. That would be digressing big time if I got into that. That hurt. But we've collaborated--

Swent: That had nothing to do with T. Y.

Ketchum: No, Professor Lin was out of the picture at that point. He had left the firm.

Swent: We don't need to talk about that.

Ketchum: No, no. No, he has always been great. We've collaborated with him on--

Swent: You mentioned several of the collaborations.

Ketchum: One of them is a bridge across the Sacramento River up in Redding, called the Lake Redding Bridge, which is an award-winning, very modern concrete arch bridge that has architectural ties to a classic, hundred-year-old arched bridge that was on the National Register of Historic Places that we collaborated on.

We're collaborating now on the East Shore Pedestrian Overcrossing, which is a big steel-arch bridge across the freeway that's supposed to be under construction next year for the City of Berkeley, to take non-automobiles across the freeway. That's going to be in the paper more, too.

Swent: When you collaborate, is he hired as a consultant to you?

Ketchum: He's hired as a consultant to us. Well, and then there are other projects that he gets that we're a consultant to him on. He has his new firm, which is called Lin Tung Yen China. He's probably talked to you about that, so I don't have to.

Swent: We haven't gotten up to that.

Ketchum: Lin Tung Yen China--you know, Lin Tung Yen is his Chinese name. It's in the natural word order. He and some of his old trusted staff started this new firm that's focused on returning something to China. His heart is very much in China, the Pudong Project and a lot of other things.

But we've collaborated with him on a number of proposals and on some projects that he has been the source of. So depending on the project, we're consultant to him or he's a consultant to us. I think that I would have to think hard to say which one was more predominant: who is the prime and who is the sub. But that's not really the issue, either. We very much provide kind of a production arm to his local practice.

We've done a number of what I consider to be important projects. One is the seismic evaluation of the Bay Bridge for CalTrans, the West Bay crossing of the Bay Bridge that we did. OPAC did the seismic evaluation of that bridge. OPAC is designing the new Carquinez Strait Bridge. He was a consultant to us on that. Both of those, we competed with T. Y. Lin International. There are other project where T. Y. Lin--they're a big firm. They get a lot more work than we do.

Swent: You can't win them all.

Ketchum: No, and we don't want to, either. They're a big firm. We really ought to be able to collaborate with them and not compete. We're a small specialty firm, and they're big. They've got probably a hundred times the staff that we have. No, not that big, but they're a big firm; we're a small firm.

Swent: I'm going to have to go; I'm sorry. I'm getting a good sense of just what it was like to work with him. Is there anything particular that you want me to ask him that you want to get on the record?

Ketchum: That's a good one. That's one I hadn't thought about. I'll have to think about that one a little bit.

Swent: Perhaps there are decisions that he made that you would like to have him talk about. That's the thing about oral history: we get the things that aren't in the written record, and also we can talk about the things that didn't happen. We can talk about the routes that were considered and not taken.

Ketchum: Well, you know, there are a lot of questions about, well, gee, if you're managing your firm, why did you do this and not that? Well, heck, one thing--and before I started my own firm I had wondered why he did certain things one way or the other because the way it was done, in hindsight didn't necessarily seem like the way I'd do it. Well, one thing that's for sure is that in hindsight your own management decisions aren't necessarily what you'd choose to do, either. [laughter]

T. Y. Lin, Focused and Flexible

Ketchum: We're human, you know? And we have human weaknesses and so forth. But he's been remarkably focused in his life. His focus has changed over the years. I'll have to put some thought into what those questions for him might be, but there are significant questions--

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Ketchum: What's the trick to keeping focused for all those years? He has always been someone who has been able to think big, and he's someone who has been flexible enough to change his focus over the years. He was a remarkable analyst as a student, and then he went to China and built thousands of bridges or whatever the true story there is. There's more to that than just "I designed thousands of bridges," and I know I've heard a lot of that. He has undoubtedly told you a lot about that, too.

And then at a particularly opportune time he fled to America, from my perspective. I don't know if at the exact time that he left he really needed to flee, but he was in the right place at the right time, getting out of there. And he came to America and changed focus again. There's a certain flexibility there, where he's risen--he's a survivor. But he's not only a survivor, but he has been able to really maintain that focus. And if there is any comment on that that he could make, I think that would be good.

And the other is that over the years he has written--oh, somewhere I've got in my archive files--he wrote something as *Optimization as a Philosophy of Life*. Everything in moderation. Even moderation in moderation. You don't want to be head over heels about moderation because that's taking moderation to an extreme. Drinking in moderation is okay, but drinking to extreme isn't. Even smoking, he said. Everything. Optimization as a philosophy of life.

Swent: Very Confucian, a lot of this, I think, don't you?

Ketchum: I think so. I think so. And then he--again--he's a technocrat in the good sense of that word. He's not a bureaucrat at all. He doesn't appear to be a nepotism sort of a guy, either. He's very much technically oriented. How does he nurture these relationships to be able to be on speaking terms with the Premier of China? He's probably talked with you about that.

Swent: Not yet. We're coming to that.

Ketchum: He has an audience with the Premier of China. And my favorite picture of him, when he's getting the National Award of Science from President Reagan. He's shaking his finger. He's taking the award with one hand and shaking his finger at Reagan! Have you seen that picture?

Swent: Yes, I have. [laughter]

Ketchum: He has been able to maintain his focus. It's that part of this optimization as a way of life. I look at him and I think, well, maybe what happened is he realized that the way of life that he had been involved in for the last fifteen years--and it seems like maybe these things occur in fifteen-year chunks--is gone now, and he has either got to drift away or pick up where that's left.

Swent: He's such a conciliator. I wondered how this would play out in his firm, as a manager.

Ketchum: I don't think he was that much of a manager. He was a leader, but he was not a manager.

Swent: Y. C. Yang was, I guess.

Ketchum: Y. C. and Felix.

Swent: He did the hard things.

Ketchum: Oh, I'm not sure it was--I wouldn't credit it all to Y. C. I think that Felix was a remarkable manager of people. T. Y. was a technical leader, but he never did the balance sheets. I came there after the firm had been in business for twenty-five years already, so I can't say that for sure.

Swent: I was thinking more of just being hard on people. Sometimes you have to crack down on people. Could he do that?

Ketchum: Yes, he could do that. He could. But he was a leader. There's a difference between leadership and management. And there are great leaders, and there are great managers, and there are many fewer that are great at both. I think he was probably a good manager, although by the time I really got involved with him, when he was seventy years old and all, I think his role was more leader and less manager. But his real role was as a leader. He would lead people. And he would crack the whip on them and get them to buckle down.

Swent: You mentioned nepotism.

Ketchum: I may have gone into that too far. What I'm meaning to say is that his basis in choosing people is their technical ability. I think he saw technical abilities relative to putting on a front of abilities better than Y. C. did. I think Y. C. was blinded by some mutual admiration society type stuff in a way that T. Y. wasn't. And, again, no offense meant to Y. C. But I think that Felix's role shouldn't be discounted there. Felix left the firm and then died, and that's a very sad story, but his role in the management of that firm can't be overlooked. I think he was another one.

But I don't mean to hold you too long.

Swent: I do have to go, and I wish I didn't.

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Author's note: I was inspired to write this narrative in 1989 when I learned that Allan Temko was starting work on TY's biography. I wrote it for Allan so that he would consider the personal side of TY, a side that is as fascinating, instructive, and entertaining as the professional side. At the time it was written, I had been married into the family for only 4 years. The narrative was the result of my observations, my conversations with TY, my talks with Verna (my wife and TY's daughter). One can say that the narrative is a snapshot of TY at the time. My lens was of limited focus. My subject was caught at that moment by a limited perspective.

Much has changed since then. TY left his firm "in disgust" in 1992. The same year he started a new firm, Lin Tung-Yen China, Inc., and I became its President. I was given the rare opportunity of working closely with him on many projects. We became close friends. Many of the sentences in the narrative can be updated, re-written to reflect the current snapshot. TY now says that he can't travel because of his health. (But we had a fantastic time in China in May of this year) He wears a hat now. But despite the many apparent changes, he is still TY.

August 2001. Robert B. Yee

JUST THE START OF ANOTHER DAY

(1989)

He wakes up promptly at seven in the morning. No alarm clock or clock radio is required. His internal clock was set the evening before when he went to bed at ten. Now at the age of seventy-seven, he requires a little more sleep than before. Perhaps his step is a bit slower, but his mind remains young. At the awakening, the mind whirs ahead anticipating the day's activities: the phone calls to be made; the letters to be written; the speeches to be prepared; the people to meet; the projects to be worked on; the lunch or dinner engagements to be met.

The bedroom is darkened with the drapes still drawn. Margaret, his wife of forty seven years, had already wakened at her usual time two hours before. She had already done her exercises and embarked on the morning routine. Now it was his turn. Still in pajamas, he starts his morning stretching exercises, torso twisting, arms stretching, eyes closed, fists clenched, stabbing the air. His mind continues to contemplate the day's activities. Before his triple bypass heart surgery almost four years ago, he would jog in place. A towel would be placed on the tiled area in the bedroom to absorb the sweat of his feet. He did not jog on the carpet. The carpet had not been changed since the house was built twenty one years before. In fact, very little has been changed. Margaret has maintained the house meticulously, caring for it like a vintage automobile that is lovingly polished with a cloth every weekend.

The house was the first of its kind: a house made of pre-stressed concrete. High rises, bridges, freeways, and other towering and lofty structures defying the imagination of thirty years ago are made of prestressed concrete. Not houses, which are made of wood, brick, and of reinforced concrete, but only in the foundations. This house is different because it is his specialty.

PROLOGUE

He is known as "Mister Prestressed Concrete." This was the nickname the engineering community and then the press gave him more than thirty years ago when he pioneered the development of prestressed concrete in this country. He had arrived in this country from war-torn China in 1946, an acting assistant professor in Civil Engineering at the University of California at Berkeley, where he had studied and amazed his professors fourteen years before. Within ten years, he was internationally famous. He was one of the first Chinese in America to receive such media attention. Since then, he has been known for many other things, but mostly bridges: as the man who wants to build a bridge across the Bering Strait to the Soviet Union; as the man who is designing the bridge to cross the Straits of Gibraltar; as the man who is designing another across the San Francisco bay. He is not a household name in his adopted country, although it is his adopted country that has benefited most from his accomplishments. He is better known in his native land, where his feats are legendary and his name enshrined in the pantheon of the great scholars, scientists, and builders of modern China. In America, the unknowing media senses that he is famous for something. He is known to be the preeminent bridge designer, yet none of his designs have been constructed locally. His field is in structural engineering, yet many mistakenly believe him to be an architect, similar to the better-known I.M. Pei. The belief is not far off the mark for he has indeed been honored by the America Institute of Architects for the beauty and imagination of his engineering designs. Yet he is best known by those in his field, his colleagues in the academic and professional world, his countless students who would greet him at the most unexpected places throughout the world.

He has never been good at remembering names. The faces become familiar, but nothing connects unless further introductions and explanations are made. Often, in social occasions, he would have to rely on his wife Margaret to remind him who was who, how and why. She has the memory for details. His is the larger picture. The daily routine is not just a part of a discipline instilled since youth, but frees him from the ordinary concerns that merely clutter the mind.

The life of the mind is his passion. He was raised to be a scholar but the exigencies of life made him a practicing engineer. He is comfortable in both the world of scholarship and teaching and the world of applying what he taught. But the first path he took as a scholar at a tender age seemed to have robbed him of the experiences gained from an ordinary childhood which is absorbed with physical playthings. Thus, he is foreign to the world of nature, of pets, camping out, wilderness survival, building a fire, and foreign to the world of practical mechanics, of screwdrivers, wrenches, saws, and hammers. Here is the paradox of a man who can engineer the most graceful and daring of structures but who cannot change a light switch, replace a faucet washer, let alone build a bird house by hand. He is on the cutting edge of structural engineering yet is not computer friendly and is befuddled by the gadgets in a Sharper Image catalog. But he knows his limitations and with due respect, operates well within the world he does not firmly grasp.

As his mind whirs, his limbs whirl, his stomach growls. He is blessed with a good appetite coupled with a love for food, preferably Chinese food. So this noodle eater from the north looks forward every morning to a typical spartan American breakfast of a soft boiled half-yolk egg, sugarless coffee with hot milk poured in it, a bowl of Special K cereal, and toast. Still in his pajamas but now in bathrobe and slippers, he leaves the bedroom and heads down the stairs. He passes the thousand square foot ballroom where he and Margaret practice their ballroom dancing on weekends. He plays no sports. Dancing with Margaret is his recreation. Light of foot, light of heart, he imagines himself as Fred Astaire. Margaret is even better looking than Ginger Rogers. She is herself a more accomplished dancer and continues to receive formal instruction and performs regularly at Showcases, a trim, lovely figure in elegant ballroom dresses.

He has been in love with her since he first saw her as a teen and was smitten by her beauty. She is six years younger. Both of their fathers were justices on the Supreme Court when China was a republic. Both of their families are from Fujian province and both were raised in Beijing. He credits her for saving his life by wanting to come to America in 1947 to see Hollywood and its movie stars. He planned to return to China after a brief teaching stint at the University. She had no intentions of returning. Had he returned, he would certainly have been persecuted for his outspoken beliefs.

Both Chinas, over the years, have gone full circle in their regard for him. Both Chinas at different times denounced him and persecuted his friends and relatives because of him. Now both Chinas honor and court him. He could not have achieved his accomplishments in China. Its lack of technological development would have retarded his pace. Its turmoil would have distracted him from his goal.

He also credits Margaret for his success. She complements him perfectly. He has a loud voice, is outgoing and easy going, talkative, and absent minded. She is softspoken, quiet, reserved, more nervous than he, and has a mind for detail, remembering everything. Theirs is a perfect marriage. She packs his bag whenever they travel. She polices his manners, makes certain no food has strayed on his face during meals, and has kept him from running for political office. He shields and shelters her from the real world. She knows little about finances, has never worked outside the home in her life, and follows his advice on how to vote. However, beneath her fragile veneer lies the strength of a woman who trekked hundreds of miles through hostile territory, with her infant son on her back, assuming disguises, to be with her husband during China's war with Japan. She has not had the opportunity to do anything as heroic since then.

Continuing down the stairs, he greets her. They speak Chinese to each other at home, using Mandarin, the northern dialect. He calls her "Margaret." She calls him "Yen-Ge." "Yen" is his Chinese given name. "Ge" means older brother. As is his custom, he proceeds out the front door, still in his bathrobe and slippers, and heads down the long and steep driveway, shuffling his feet as he goes, partly because it's still early in the morning, partly because it keeps him from slipping and sliding down the driveway. The object of this exercise is in view at the bottom of the driveway: the San Francisco Chronicle. This is about the only time he will have to read the newspaper. If it isn't there, he would feel the loss that comes from not knowing.

Climbing back up the driveway, the prestressed concrete structure looms like a fortress above him. It sits near the top of the East Bay Hills in a small city called El

Cerrito. Four years before, it had named a day in his honor for his receipt of the National Medal of Science. The honor might have coincided with the city's attempt to retain him on one of their design review commissions, from which he resigned shortly thereafter for lack of time.

The house appears to dwarf others in the area, although its 5,000 square footage was comparable to some of the neighboring structures. But his was the only structure with a ballroom. His was the only structure that had concrete piles driven into the ground for its foundation. It was built to last, and certainly beyond his lifetime. It was certainly meant for extraordinary living, although it has never been used as such. This he realized the longer he lived there. The house became like a grand old English country house which eventually was donated by the descendants to the National Trust because of the high maintenance. Wishing to spare their heirs of that decision, he and Margaret donated the house to the University two years ago, retaining a life estate interest. This not only satisfied his debt to the University for giving him a job, for providing an opportunity to research, innovate, teach, and apply his talents, but it was only a great institution like the University which could handle a structure like this. He hopes the University will use it when he and Margaret are gone, not sell it. But it will be the University's option.

The warmth of the house is in marked contrast with the brisk morning air. The thermostat for the radiant heating is set at 65 degrees. He reads the newspaper at a small table in the kitchen. The table is against the floor to ceiling windows overlooking the bay with the three bridges in view. Before he opens the newspaper, he knows there will no mention of his name in today's issue. Usually he knows days in advance when his friend Allan Temko will be mentioning him. He was not interviewed the previous day and his firm has no announcements to make. Most of the newspaper is worthless to him. The entire sections of sports, entertainment, classified, and food are first discarded together with any advertising inserted into the edition. He does not read Herb Caen, (except once when he was mentioned entertaining a Vanderbilt) the comic page, the obits, or any human interest stories. He looks at the headlines, not the pictures. He reads no columnist with any regularity. It all depends on what catches his eye. He rarely reads the letters to the editor. So, with the hard news and the financial page, he settles down for a quick read while waiting for Margaret to finish cooking breakfast.

He hopes to read something about China in the morning newspaper. China is much on his mind lately. The problems the country is facing are serious and complex. The country is so vast. It has changed so much during his lifetime. In his youth, he wanted to study politics as the best means for him to help his country. But his father wisely directed him into the science and technological fields. He has not lost his interest in politics. At times he wistfully thinks if only he were younger, he could contribute so much to his native land. It was a pity that China was inaccessible to him for thirty years, during the prime of his life. But it is not his nature to dwell on what might have been.

Today's edition has no articles worth clipping. He has butchered many a paper in the past. But he has slowed down lately. Perhaps his reading has been leavened by historical perspective and there is no longer urgency in the moment. Perhaps the people for whom he was clipping now catch the articles as often as he.

The newspaper is discarded as he breakfasts with his wife. It is much easier for her to make breakfast when her husband does not have a cold as there is no need for fresh hand-squeezed orange juice, and plenty of it. Sitting across from each other, they speak of things in a way that old married couples often do, without an agenda, without intention or explanation.

Sometimes the meal is interrupted by a phone call. Since it's usually for him, he invariably answers the phone. The number is unlisted. If the call is during breakfast, he is usually very brief. He always answers the phone by announcing his name, the first two initials and the last name, never with a "hello." He ends almost every phone conversation abruptly, wasting no time with concluding pleasantries. On many occasions, he has inadvertently hung up on callers when they are in mid-sentence, believing that there was nothing more to be said. But he will always take the time to speak with his grandchildren, especially his two youngest ones who are just learning how to talk. Sometimes, when he hears the phone ringing but is not in time to answer it, he would then make calls to those whom he thinks might be calling. There is no answering machine in the house. Perhaps the gadget is just too complicated or bothersome.

With breakfast finished, he ascends the stairs to his study, which is flanked by the master bedroom and his daughter's former bedroom. This bedroom still contains some of her belongings. It has not been used by her since her occasional weekend visits before she got married almost five years ago. The downstairs bedroom is used by the occasional visiting relative. His son uses it on the occasions when he must be at the University the next morning and does not want to commute back and forth from Palo Alto. The house does not have many visitors. Rarer still are the overnight guests.

The study is a brightly-lighted room facing the bay. It contains his desk and Margaret's desk and a drop table built into the wall. On the table are various correspondence and documents, and a few awards. Throughout his lifetime, both he and Margaret have accumulated numerous awards, medals, and trophies. He received his for professional achievements. She received hers for ballroom dancing. There is no place in the house set aside for medals, plaques, and trophies. A few would be placed in various locations throughout the house, the rest would be stored behind closed cabinet or closet doors. The framed honors, if significant, would be hung in his office in San Francisco or in the reception area.

He continues to delight in receiving medals, honors, and publicity. He doesn't seek it out. It just happens when he is remembered, when something just has to be awarded to someone, or when an event is deemed by the media to be newsworthy. His star has not faded during the past thirty-five plus years. Although he enjoys it, his ego does not need it. For years, he has been content and satisfied with his life. Professional success alone is no assurance of contentment. He knows successful people who are unhappy. His philosophy of life, of optimism grounded on optimization, has borne him through times of adversity, failure, and disappointment. He has shunned the temptations of restless ambition. He has avoided greed of every kind, whether it be for power, fame, or fortune. Once he read somewhere that it was just human nature for one to want more and more. This did not sit well with him as some maxims of his classical Chinese upbringing counseled making do with less. At some point of his life, he found that he had all the financial security he needed and resolved that he did not need more. He had enough. He was satisfied. "Nothing in excess" is a thumbnail description of his philosophy. He expresses it more positively in one word: optimization. He has written papers and given speeches on this subject. Now he is in the process of co-authoring a book on it.

People who know him marvel at his equanimity. They have never seen him show his temper or become angry. They have never heard him curse or say anything derogatory of another person. His daughter claims that she's the only person who has ever angered him. The worst thing he's ever said to her happened many years ago, when he remarked that something she did was foolish. She admits it was foolish, but it still hurt. His philosophy in dealing with others is expressed in the following quotation: "Fear incites fear, complex breeds complex. If one learns to control one's own fear and complex, and at the same time understands those of others, one will have gone a long way toward success and happiness." After writing this quote for his sketch in WHO'S WHO IN AMERICA, he has become more conscious of it in encounters with difficult people. Perhaps as an optimist or a practitioner of the "Golden Rule," he is open to and presumes good intentions of those he initially encounters. This has occasionally led to people taking advantage of him and abusing his goodness. Although he has become wiser about certain people, he has not become discouraged from his basic approach. He prides himself in his ability to get along with just about anyone.

He is without pretensions and erects no barriers between himself and others. He prefers to be called by his initials "T.Y." rather than by any of his titles, whether it be "Mister"," Doctor", or "Professor," regardless of the circumstances. Extremely approachable, he appears to personify friendliness and openness. He does not hesitate to strike up conversations with strangers he is by chance standing or seated next to. He is a good listener with attentive nods and enthusiastic responses.

Although he feels there is never enough time in the day to accomplish his tasks, he never shows impatience, pressure or stress. In his easy-going manner, he would give someone an assignment, with a "no rush" or "whenever you have time." If there were in fact a deadline the same day, he would add either "at the end of the morning", "this afternoon," or "at the end of the day." Without these specific time limitations, the inexperienced assignee would either at the next encounter or the next day be asked if the task were completed and realize that once assigned, the task would not be forgotten by him until completed, and one would not want to bother him to monitor it.

This morning, he does not have any deadlines to meet. He goes to his desk which is nearest the double doors facing the windows. Margaret's desk is near the windows facing him and the doors leading into the ballroom. His desk and chair are steel government-issue type, spartan and utilitarian. On his desk are the tools of his trade, a typewriter and a telephone. The typewriter is an older electric model, without microchip, daisy wheel, typing ball, or correcting key. The telephone is the standard phone company-issue desk model. It has no memory buttons but at least it is touchtone. There is no computer in the house. There is no calculator either. His mind is his calculator: more handy, at times faster, and of course less fallible as it is not dependent on digital input or the power sources of electricity, solar, or battery.

He checks his appointment calendar to make certain that there are no appointments this morning. It is not affixed to the wall or his desk. It is in his wallet consisting of a lined note pad. Before the first of every year, he plans his year's events by using one page from the pad for each month, numbering on the left side of the page either one through thirty-one, one through thirty, or one through twenty eight, whatever the case may be. He uses fractions to represent parts of the hour. For example, for an appointment at 1:15, it would appear 1 1/4. Sometimes his appointments are made a couple of years in advance. These would be speeches he would make or conferences he would attend in other countries. He accepts speaking engagements as long as the sponsor pays the way for Margaret and him, using first class accommodations when overseas. It is generally worth it to the sponsor as his speeches are reputed to be the high point of many gatherings. He has never read a speech. He almost always speaks extemporaneously with the help of slides or a brief outline. Where the designs and innovations of prestressed concrete structures are concerned, nothing speaks louder than slides of his works past, present, and future.

Many of his slides are stored in the built-in cabinets behind his desk. The cabinet doors in his house shield from view most of his library. The remainder of his library is in a room located under the ballroom where his documents are stacked and stored in steel warehouse-type shelving. Everything is neatly organized. The only books exposed to view are those stacked in foot-high piles on the coffee table in front of the living room sofa. The floral patterned fabric sofa is the place of his relaxation. He converses here with visitors. Here is his place of leisure reading. One corner of the sofa has his blanket, eye shade, and towel for his naps. The towel is for him to rest his bald head on so that the sofa will not be stained. The sofa is as old as the house.

The study is for more serious business. There are two oval rugs in the study room, both handwoven by Margaret from wool scraps. On the wood-paneled wall next to his desk is a plastic relief map of the United States next to a color photograph of the San Francisco Bay Bridge. The only depiction of any of his works is a large modern-type artist`s conception of his famous "upside down" bridge over the Rio Colorado River in Costa Rica. He had commissioned a student to paint it many years ago. It hangs over the unused fireplace in the living room. It may appear strange that he does not surround himself with paintings, photographs, or models of his work which will forever bear testimony or at least show off his skills, his talents, and his accomplishments. Let others put it on postcards and magazine covers. Let other countries put it on their postage stamps. For him, he does not need constant reminders. Besides, where would it end, for he is endless in his conceptions.

In fact, where would it begin, for when he returned to China in the 1930's, he had designed and directed the building of hundreds of bridges for the Chinese railway within a brief time. Those were the days of adversity, when bridges were miraculously built when materials were scarce, technology undeveloped, with crippling food shortages and disease, and a bombing and strafing enemy. All he had was his army of conscripted laborers, his Masters degree from UC Berkeley, the impertinence and boldness of youth, and boundless energy and imagination.

It seems like he's lived several lifetimes. He remains at his prime, still productive, still creative, still full of the irrepressible zest for life. He no longer has to publish or perish, teach courses, supervise graduate students, or run a company. He really doesn't have to do anything now. But he knows that he must do something, for standing idle has never been his nature. Whenever he is sick, he is restless and yearning to recover. If he is inactive, he tires easily.

In addition to his speaking engagements, he has many projects going on at the same time, mega-projects that may not be realized at all, and perhaps not completed within his lifetime. But he is most serious about the projects, devoting considerable time, energy, and on occasions the resources of his firm. He will say that he's doing it for fun. It really means that he is not being paid for it and is enjoying his projects immensely. To the consternation of some, he declares that he would rather die a million dollars in debt than to die with a million dollars in the bank. It merely means that he would rather enjoy life to its fullest than to conserve and hoard without personal enjoyment merely for the sake of posterity.

And so he goes to work every day, sometimes on weekends if there is something going on or nothing better to do. He leaves the house after nine, after the rush hour traffic has taken its course. Still in his pajamas, he shaves with a non-electric razor blade. His face is still unlined with age. His eyes continue to sparkle, his energy unabated. His gray hairs are concealed by his baldness. He still looks quite young. This face, which he has been seeing in the mirror every day, has not changed as long as he can remember, as he had lost his hair at an early age. The pictures could tell a different story. But his reflection mirrors youthfulness.

His clothing is a different matter. He wears either a sport jacket and slacks or a suit to the office. He always dresses in a white shirt and tie. He has an extensive tie collection, many of which were gifts from people who couldn't think of anything else to give him. Margaret buys his shirts for him. He wears a size 14 1/2 x 32. She doesn't buy him button-down collar shirts since he always neglects to button down the collars. She usually accompanies him when he buys a new suit, which is infrequent. He wears a 38 short. He neither dresses expensively nor fashionably. Although careless about fashion, he is a careful dresser, always appearing well-dressed and well-pressed. His shoes are always well-polished by Margaret. He wears a 7 1/2 shoe size. When he dresses casually, he usually wears brown slacks, a brown cardigan, a white shirt, and black shoes. The top button of his shirt is usually buttoned although he does not wear a tie when casually dressed. When he is really casual, he rolls up his shirt sleeves on the outside of his sweater sleeves. He doesn't wear a hat, doesn't own a pair of jeans or tennis shoes, and is never seen in a pair of shorts. He doesn't wear a hat or even sunglasses.

Like most people, he pulls on his pants one leg at a time, securing it with a leather belt. He doesn't own any suspenders. He hasn't worn a wristwatch for many years. He prefers pocket watches. For many years, he went through an entire series of pocket watches, either losing them or dropping them at such frequency that he didn't bother to buy them any more. So, for a few years, he would rely on a digital liquid display watch embedded in the cap of a ball point pen. People would wonder why at certain times he would pull out his pen and study it. His current timepiece is a pocket watch given to him as a birthday present by his daughter and son-in-law. It is at the end of a chain and has a cover over the face that flips up at the touch of a button. When he senses that it's time to go, he pulls the watch from his pocket, flips the cover, smiles, clicks the cover close, stuffs it back into his right pocket, and those observing know its time to wrap things up. It is an effective prop. The only jewelry he wears is a simple gold wedding band worn on the middle finger of his left hand since 1941.

The contents of his wallet are also simple. He has his pocket calendar, a small amount of cash, some identification and credit cards. He doesn't carry photos of his family with him. In the wallet is a notice that if it is found, the finder can keep the cash contents and receive an award of $100. provided the rest is returned to him. He hasn't lost it yet. He carries a small handful of change with him loosely in his pocket, together with a handkerchief and a few pieces of kleenex. His current pen is a ball point MontBlanc. This is the most expensive pen he has had. It is also his second one, having lost the first after a year. He does not carry a pencil. His other favorite writing instrument, which he does not carry, is a red felt-tip pen which he uses for short notes, comments, or corrections of documents.

At last, he slips on his glasses. He is near-sighted and requires glasses for driving. He does not normally wear them around the house. Many believe he wears glasses all the time, which he usually does when he is not home, as it's easier for him to wear it than to slip it on or off. It becomes more of a bother to put it in a pocket or a case. Margaret's vision is still perfect. Their children both required glasses at an early age. He wears gold colored wire-framed glasses. The only time he ever wore plastic frames was as a youth in China. He never uses his glasses as part of his speaking gestures, neither slipping them on or off for emphasis or sticking the temples in his mouth to show pensiveness.

In fact, nothing about him is studied, whether it be his appearance, his manner, or his speech. Although he is a naturally good chess player and an even more accomplished go player, he doesn't play games, whether it be for play or for work. His approach is sincere and direct without guile. In their dealings with him, people can never claim that he has ever said one thing and meant another, nor can they ever claim to have been manipulated by him. Because of this, some assume he is simple and naive. He would never deny it, and if told, would only laugh as if the joke were on him, though he knows better. He is extremely comfortable with his self-esteem and his ego.

As he leaves the house for work, he reminds himself that Margaret is still in the house so he will not be setting the alarm behind him. He's done that before. More often than he would like to remember, he has not only failed to set the alarm when Margaret had left before him, but had also forgotten to close the garage door.

They have two cars in the garage. She drives a Volvo, her first. Her last car was a Mercury that never started properly. His car is a two year old Buick. He has tried to buy American, in loyalty to the economy and to the people, but his purchases have been less than loyal to him. He seems to have the knack of buying lemons. No matter, for he drives a car for approximately two or three years before he either gets tired of it or something goes wrong with it. Then he buys a new one. He has never owned a luxury car. To him, a car is not an extension of his ego, but of his feet, utilitarian and without adornment. Luxury to him is having air conditioning or a stereo cassette player in the car. With his cassettes of classical music, he can drive untiringly for hours, which he frequently does, to the amazement of some and to the anxiety of others considering his age.

While some would boast about their endurance, longevity, their remarkable physical condition, appearance and youthfulness, for some reason both he and Margaret are sensitive about their ages and feel uncomfortable in talking about how old they are with others. Even with their grandchildren, they prefer not to be called "grandmother" or "grandfather" as it makes them feel old.

He backs his car down the long driveway. He has never backed his car up the driveway. The car is equipped with an automatic transmission. He first learned to drive when he was a graduate student here in the 1930's, taught by his older brother who preceded him to the Berkeley campus. For many years, he drove a standard transmission until automatic transmissions became more commonplace.

As he proceeds down Moeser, which runs steeply up and down the El Cerrito hills, he shifts the transmission into "low" to save on his brakes and the engine responds with a high-pitched whine as the car picks up speed to around 35 mph. He drives quickly and skillfully along routes he is familiar with. As he merges onto I-880, westbound to San Francisco, the morning commute has not abated and the traffic is moving relatively slowly but smoothly. Normally, he does not shy away from the fastest lane, but going to the City, he keeps to the right lanes as he must eventually head towards the right when the freeway forks off towards the bridge.

Although he is a pioneer in prestressed concrete, bridges of all types are his passion and his specialty. For structural engineers, bridge engineering is the most challenging and provides the engineer the greatest opportunity to design and innovate. In the design of a building, the architect is the master. The design of a bridge is in the hands of the structural engineer, unless he shirks his prerogative and leaves the matter to one more talented. He has always had a firm hand in designing every bridge he engineered. As bridges are his love, he is greeted by his three-bridge view as he drives to work every morning. Both the Golden Gate Bridge and the Oakland-San Francisco Bay Bridge were in the process of being built when he first came over as a graduate student.

His firm is presently studying the seismic safety of the Golden Gate Bridge and the possibilities of putting a second deck on it for transit use. He has not done any work on the Bay Bridge. However, he has proposed to build and maintain a privatized Bay Bridge, including a Mid-Bay Bridge joining the San Francisco and Oakland Airports. He became involved in this project when he was asked by Allan Temko, Architectural critic of the San Francisco Chronicle, and Aaron Green, a protege and associate of Frank Lloyd Wright, whether it was possible to engineer Frank Lloyd Wright's Butterfly-Wing Bridge designed for a Southern Crossing in the early 1950's. What became an academic question has led to a real possibility as traffic conditions worsened, the call for another bay crossing was revived, and a privatization bill was passed by the California legislature.

As this diminutive man drives in his nondescript modest car along the crowded freeway, his fellow travelers do not realize the stature of the man they share the lane with and his contributions to bridge and freeway building. If they did, they would honk him out of recognition, not in their usual manner. He never lets the impolite or offensive honking of others bother him. He just ignores it. His motto is: "No worry, no hurry, no angry, no sorry." Although he never hurries, he is very punctual and for some reason, expects it of others.

He drives past a complex of condominiums built on Albany Hill to his left. Although he had nothing to do with its engineering, he was involved in it once when he was consulted as an expert witness over a structural issue. Every overpass he drives under has significance to him as to whether or not he had contributed to its engineering. If he had no contribution, it would neither use the "Lin-tee," which was named after him, nor prestressed concrete, which he pioneered, and would appear cumbersome and bulky, using too many supporting piers. Prestressing, which is now standard for concrete overpasses, permits greater spans, eliminates hazardous piers, and does not require clumsy designs. To him, there should be beauty and grace to something as unromantic as an overpass or interchange.

Driving past Emeryville, he is flanked by two of his projects: an engineering achievement of his to the left and a troublesome lawsuit to his right. His firm had done the structural engineering for the Watergate complex to his right. After construction, the condo owners filed a lawsuit complaining of leaks and cracks, attributing it to faulty construction, engineering and design. Although he could prove that there was no fault with the structural engineering, the case was settled before trial and the firm's contribution to the settlement, which was approximately 2% of the total, matched the fee it had received for the job. The structural engineering fees in construction projects are small and insignificant in view of the importance of the contribution. The developers and the contractors make all the money. Yet if there's litigation, the structural engineer is invariably sued and must participate in the expensive litigation process. Oh cursed lawyers. He believes there are just too many in this country and they complicate things unnecessarily. He has little use of them and often signs documents without legal consultation or even reading the fine print, much to the horror of his lawyer son-in-law.

The Pacific Park Plaza luxury condominiums to his left is one of his achievements. It used his firm`s innovative seismic safety designs and withstood the latest earthquake without sustaining structural damage, even though it sits on soft ground less than one mile from the ill-fated Cypress overpass. Since the earthquake, his firm has been deluged with disaster-related work. The most important and most publicized of these are consulting projects for Caltrans in retrofitting the Embarcadero freeway along the San Francisco waterfront and on their plans to replace the collapsed portion of the Nimitz freeway in Oakland. He muses that it takes a natural disaster like an earthquake for the profession of structural engineers to be appreciated. Among the engineering field, structural engineering is one of the most rigorous but commands none of the glamour or high salaries as electrical engineering.

For many years, his firm has suffered lean times because of the lack of public monies for new transportation projects and the resulting deferred maintenance of existing structures. He hopes the public and its officials will learn from past follies. Nonetheless, he is gratified that immediately after the disaster, the firm he founded and guided was called into service. Whatever his company is lacking in fame, size, or power is compensated by its reputation for excellence and innovation.

Although he does not own the firm, it is his baby, it bears his name, and the strength of his reputation and that of his firm is intricately and reciprocally related. He personifies the company and his personal reputation is passed on to it. In the same token, the professional accomplishments of his firm, of his associates and staff, redound to his personal reputation. His position is Honorary Chairman of the Board. He takes no active part in the company's operations but is always consulted on interesting projects. He goes to his office every day. It is good for morale, both his and his co-workers`. His presence assures them of stability, continuity, and quality. They call on him for important presentations when the force of his personality, the strength of his reputation, or the clarity of his delivery will make the critical difference. They continue to ask for his advice as his mind is still fertile with ideas and full of energy. The company, in turn, backs up his projects and gives him free rein. The artist does not starve and is free to create. The benefactor benefits from the works, whether it be jobs that may come out of it or the publicity it might generate. It is a good relationship.

As he nears the bridge toll plaza, the traffic slows to a stop and go pattern. The toll booths were designed by his friend and collaborator, Myron Goldsmith, the Chicago architect. Their most famous collaboration, the Ruck-a-chucky Bridge over the American River a hundred and fifty miles north, may never be built because of environmental opposition to a dam.

His advocation usually places him in opposition to the environmentalist, the advocate of unspoiled beauty. But if nature must be spoiled for the sake of man, he is the advocate of beautiful and graceful structures that visually enhance the environment, not detract from it. His school of thought sees the beauty in the majestic Golden Gate Bridge spanning the mouth of the bay, not in damning its presence as an obstruction to a view of the Pacific. To him, man's need to build and alter his surroundings is inevitable.

Environmental concerns are important, not overriding. Again, optimization is required and a proper balance be made. Take his proposed Mid-Bay Bridge. The environmentalists decry its impact on the wetlands and its encouragement of the private automobile. Yet the Bay Area's traffic congestion will be getting worse, not better. Another bridge will serve not only to relieve the physical strain on existing bridges, but will alleviate the human toll caused by the tensions of a longer commute. Reduced traffic congestion would also reduce fuel consumption and the emissions of its pollutants into the air. For him, the private automobile is a necessity of his life and work. He has never taken public transportation to work and has never carpooled. It would not only be too time consuming, but impractical.

Besides, he does not mind the drive and avoids the increasing congestion. He optimizes the time in the car by listening to his classical music, or the news on the radio, or by thinking. Although attentive and alert when he drives, he is uninterested in his fellow commuters. He notices neither the kinds of vehicles around him nor the faces of any of their occupants. Once, when a car had stalled on the bridge, he calculated that it would be less costly to push the car over the side into the bay than it would be to compensate the commuters for the time lost from work.

On the fiftieth anniversary of the bridge's opening, he and Myron Goldsmith were asked by the Chronicle to develop a state of the art concept for a bay bridge. Their design envisioned a steel suspension bridge, with a single deck providing fourteen lanes for traffic, plus additional shoulder and service lanes for emergency vehicles. It would be a magnificent structure of beauty and utility.

It's a shame that many of his innovative and beautiful bridges have not been built in this country because of monetary and environmental constraints and the old fashioned thinking of those comfortable with the familiar. Foreign countries have been the beneficiary of many of his creations. There, no established experts impede nor do the monolithic construction companies bother to elbow their way past him with their monetary might to snare the contract.

Unfortunately, unlike great paintings which become valuable only after the death of the artist, great building concepts and plans merely gather dust and eventually crumble, deteriorate, and become discarded after the death of its creator. He hopes his firm will survive him. It continues to do well even when he is less involved.

Approaching Treasure Island, he cannot see the massive dock his firm engineered recently. A bridge of his design would not block his view like this one. As he emerges from the tunnel through Yerba Buena Island, the great towers of the suspension half of the bridge loom before him. This part is the real bridge. The first part was like a railroad trestle. He notices fresh paint on the steel members. Steel bridges require constant painting for maintenance. Frank Lloyd Wright once opined that it was paint that held steel bridges together. But prestressed concrete bridges do not require painting. Although he sees all bridges critically, he does not criticize the engineering of this bridge. It used the best materiel, technology, and engineering available at the time of its building. It has withstood the test of time. Although it is an important bridge, it does not rank as a great bridge for it is neither an engineering marvel nor an engineering feat.

Author's note: The narrative ends here abruptly. At the time of its writing in 1989, the writer did not know enough about TY's views on his work in San Francisco. So nothing more was written and the manuscript remained unfinished.

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CALIFORNIA

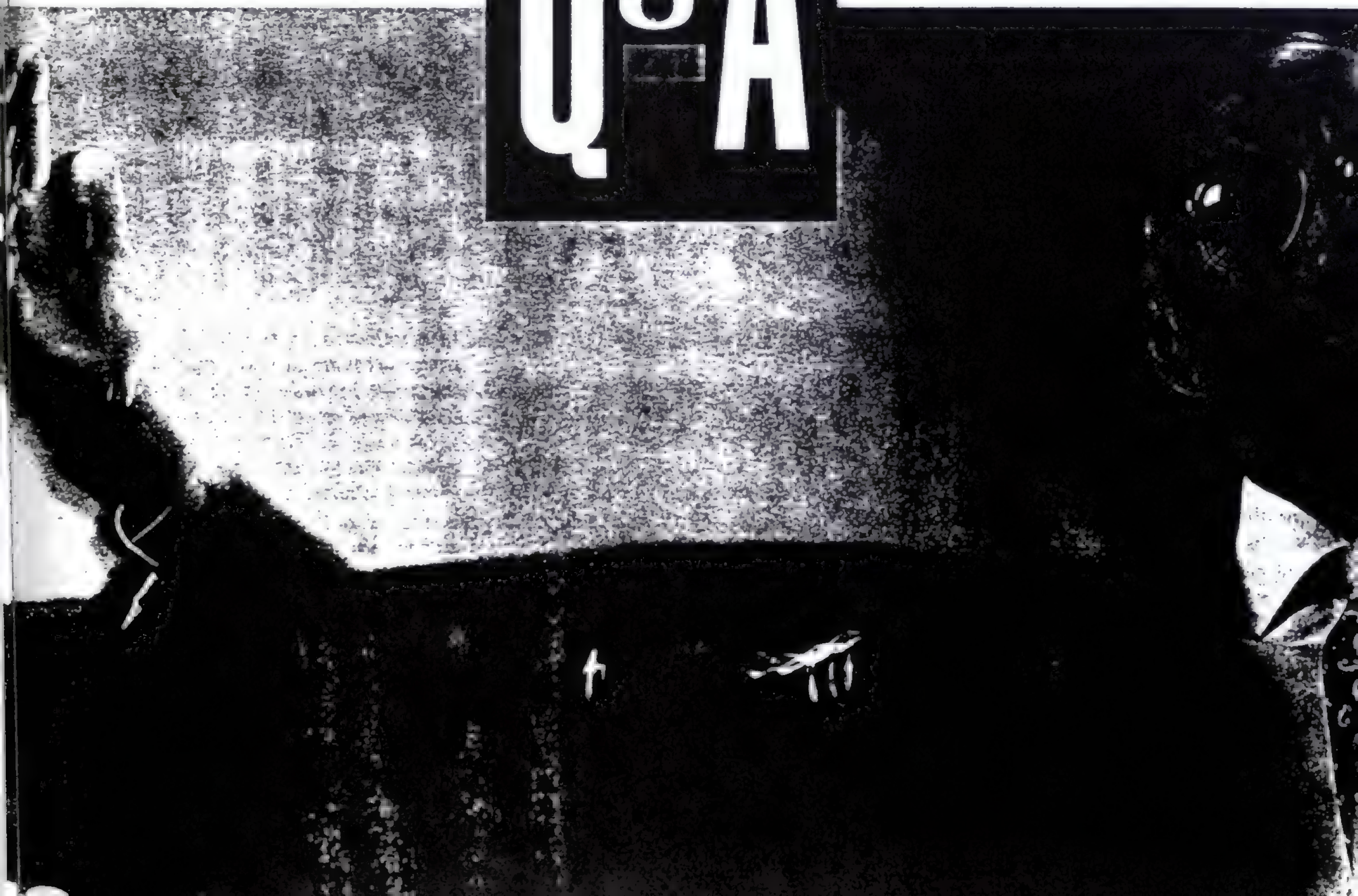
Q&A

Tung-Yen Lin—always called T.Y. by his family and friends—is a builder of bridges not only between continents but also between peoples. At the age of 82, the California Alumni Association's Alumnus of the Year for 1994 is perhaps the greatest structural engineer in the world, and surely the most fearless.

Some of his boldest designs are so far ahead of their time that they remain unbuilt. Among them are the Intercontinental Peace Bridge, which would carry traffic, trains, and pipelines across the Bering Strait between Siberia and Alaska; and the astounding U.N.-sponsored proposal for the Strait of Gibraltar, which would link Spain and Morocco with twin 16,000-foot "superspans," each nearly four times longer than the main span of the Golden Gate Bridge. Whether or not they are eventually built, there remain scores of completed works—spanning rivers and bays and remote gorges like scientific sculptures, or covering convention centers and sports arenas with tremendous arches and thin-shell roofs—that astonish and delight ordinary people, as well as his fellow engineers, in many parts of the world.

Yet many of T.Y. Lin's bravest concepts are not works of engineering at all, but humanistic constructs of a mind that embraces poetry and philosophy, economics and politics, education and history. His own life, quite literally, has been a bridge between East and West. He has spanned the distance between a still classical and partly archaic China, where he was born in 1912, and an America which opened limitless vistas of modern science and technology, even in the midst of the Depression, when Lin arrived in Berkeley as a graduate student in 1932. To Lin, then as now, there seemed no reason why he should not try to unite the best qualities of both civilizations. The Confucian ideal of selfless public service was not really at odds with American determination to get things done, and done well. If the two cultures could be "organically" combined, as he was to say many years later, something extraordinary might occur: Both sides might win.

This has been the guiding principle of a career which Lin once assumed would take place entirely in China. Even though he did brilliantly at Berkeley, making an important breakthrough in structural analysis (still known as Lin's Method) in his master's thesis, he was morally bound to return home. His father, a high court justice described by T.Y. as exceptionally



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honest (because, unlike some judges, "he never made money on the bench"), had taught him from early childhood that he was obliged, as an educated person, to help his country emerge from backwardness. How desperately China needed him T.Y. learned when he returned to Shanghai in 1933.

He soon got a job with the Chinese Government Railways. To his surprise—because he had pointed out mistakes made by senior engineers and might have been considered rude by his elders—he was promoted to chief design engineer of the railroad system. A period of heroic construction followed. Against terrible odds, preceding the Japanese invasion and persisting after attacks began, T.Y. and his crews built about 1,000 large and small railroad bridges and culverts across the Yangtze River. They had no heavy machinery and used whatever materials were available, mostly stone and timber. With T.Y. in Yunnan, designing fortifications, roads, and new rail lines, his young wife Margaret, whom he married in 1941, walked the width of China from Shanghai to join him, carrying their infant son Paul. Accompanied only by her teenaged sister, she braved her way through enemy lines and dangerous villages.

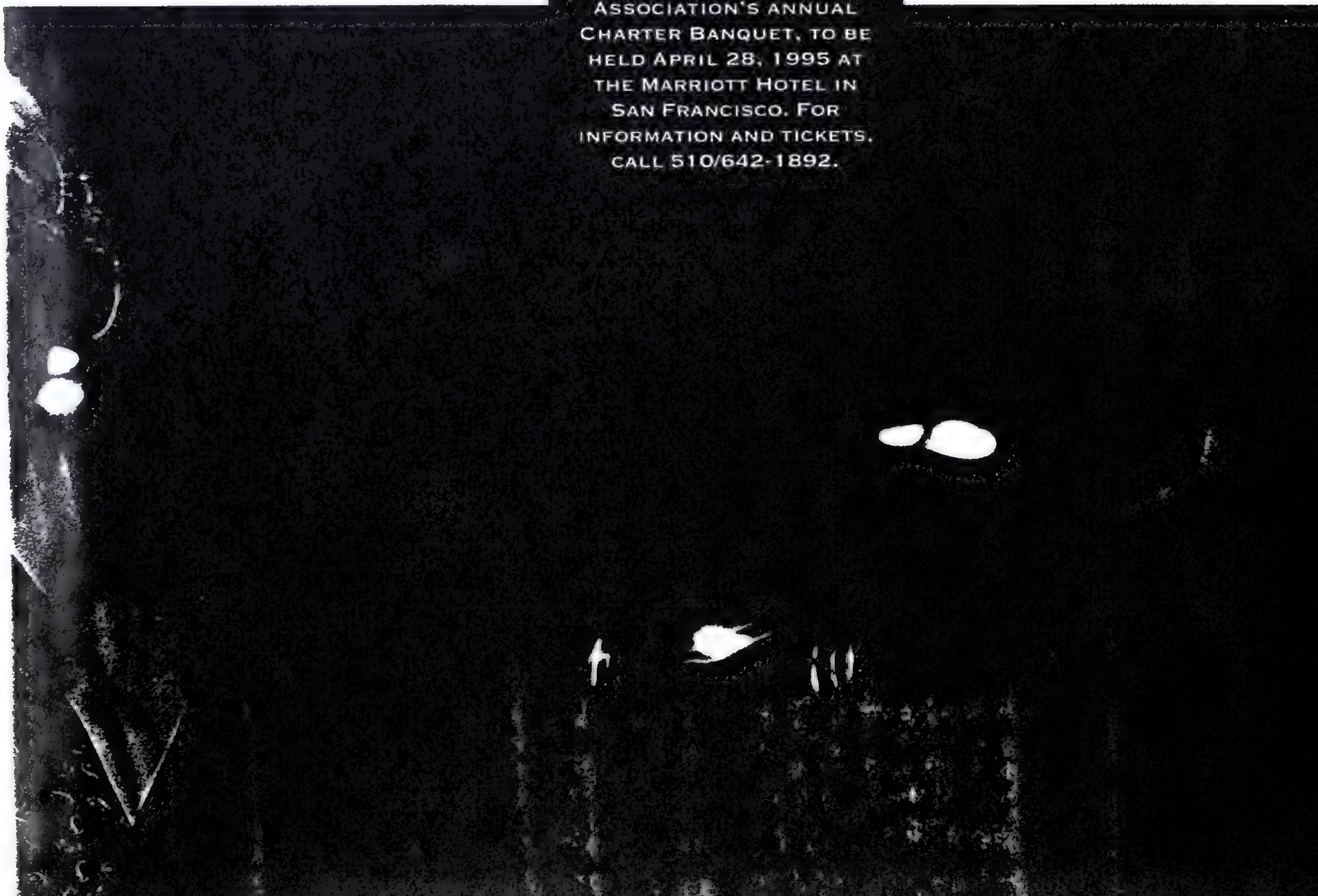
After the war with Japan came civil war. T.Y. thought of staying on, either on the mainland or in Taiwan, but his old professors at Berkeley somehow got a letter to him, offering him an acting assistant professorship in 1946. The appointment was made permanent the following year, as Lin quickly established himself as a teacher with rousing ideas and boundless energy, who never stinted time for his students.

The rest is a major chapter in the history of engineering education, theoretical and applied research, and professional structural practice. In T.Y.'s case all three were inseparable. He might never have become the world's foremost master of prestressed concrete (as well as a masterful designer of steel structures) without the University's sumptuous research facilities and the collaboration of gifted colleagues. Together they transformed the solidly capable civil engineering department of the 1930s into the magnificent faculty that was unsurpassed in the world from the 1950s onward.

Thanks to the structural laboratories on the campus and at the Richmond Field Station, where huge beams, columns, and floor slabs could be tested until they failed under extreme stresses, prestressed concrete was shown to perform predictably and reliably. This was done according to the theoretical analyses that T.Y. had done more than anyone

HONORING T.Y. LIN

THE CALIFORNIA ALUMNI ASSOCIATION HAS CONFERRED ITS HIGHEST AWARD, ALUMNUS OF THE YEAR, UPON T.Y. LIN, M.S. '33. HE WILL BE THE GUEST OF HONOR AT THE ASSOCIATION'S ANNUAL CHARTER BANQUET, TO BE HELD APRIL 28, 1995 AT THE MARRIOTT HOTEL IN SAN FRANCISCO. FOR INFORMATION AND TICKETS, CALL 510/642-1892.



'I WANTED TO COMBINE THE METHODS OF THE

else to perfect.

In short, he took the mystique out of this revolutionary material, which combines the tensile strength of steel with the compressive resistance of concrete. At a time when conventional engineers thought prestressed concrete could not be used in spans of more than 100 feet, T.Y. proved, by precept and example, that it could be pushed far beyond timid limits—to spans of 500 and 600 feet and more.

And soon the unprecedented structures began to appear. The curving 23rd Avenue Overpass in Oakland was flung lightly, like a bent bow, above a railroad right-of-way. Still stronger was the Hegenberger Overpass, leaping over the BART tracks near the Oakland Coliseum. At the same time, the firm of T.Y. Lin International, which he founded in San Francisco in 1953, was doing work around the globe, with offices in Asia, Latin America, and many places in North America. T.Y. was personally involved in all of the most interesting projects—virtually every type of building, as well as the ubiquitous bridges, from Costa Rica and Libya to Taipei and mainland Asia, where he is now design-consultant for a 15-mile multi-span bridge at the mouth of the Yangtze.

To non-engineers, perhaps the most fascinating aspect of these pure works of engineering is that they are also works of art. There is an unmistakable spiritual grandeur in such masterpieces as the 300-foot arches of Moscone Convention Center in San Francisco, the largest underground room in the world. The arches are spaced in pairs, 90 feet apart, down the 800-foot length of the great hall. What's more, they are strong enough to support three-story buildings on the roof above. This is engineering on a grand scale. But no problem, if it arouses his curiosity, is too small for T.Y. Lin. His own house, where he and Margaret—a tango champion—dance in one of the last private ballrooms anywhere, is a prestressed concrete structure. When T.Y. heard that the great Italian engineer Pier Luigi Nervi had done a racing yacht in concrete, T.Y. responded with a prestressed trout rod.

But it is for the great works that he will be remembered always. To sort out his masterpieces is difficult, but his supreme achievement—technically and aesthetically—is probably the design for the Ruck-a-Chucky Bridge over the American River above Sacramento. Designed in collaboration with his friend Myron Goldsmith, a peerless architect/engineer, the 1,300-foot-long arc would have been the longest curved free-span bridge in history, and as beautiful as any bridge of our time.

Because an ordinary suspension bridge would have been discordant in the gorge of the American River, marring the mountainsides with bulky towers, T.Y. and Goldsmith decided that towers were unnecessary. Instead, they would have slung the bridge from the forested slopes with cables that defined a pure geometric form, a hyperbolic paraboloid, that would have the lyrical splendor of Mozart's music. All this depended on a dam being built far downstream, which would have created a reservoir 400 feet deep. But the dam project was killed, leaving us with only drawings and models of a Platonic idea of a bridge, which should exist always in the minds and hearts of those who treasure the art of engineering.

Q: *When you came here in 1931, what was the Asian population at Berkeley? It must have been small.*

A: There were a few Chinese students here who had been born in this country, but I think I was the first student directly from China in the College of Engineering.

Q: *Your brother was already here, to welcome you when you arrived.*

A: He was vital to my stay in Berkeley. He was working on his doctoral degree in political science and was teaching at Cal. He had been in the United States about six years.

Q: *What impact did the Depression have on you?*

A: When I first came here, I spent all my time learning about technology and science, but nothing about the social, political, or economic aspects of this country. Roosevelt had been elected President, and that was a big event, but I didn't understand what it meant. Then my brother, who had something like $1,500 in the bank, one morning said to me, "T.Y., we're broke. The bank closed." So, a few months after I arrived here, I had to look for work.

My first job was as a "service boy," in an apartment kept by four students. I answered an ad, and when I applied, they saw me, a Chinese boy, and asked, "Do you cook Chinese food?" I said yes. So the first day I cooked fried eggs—and they were burned black! I only worked there a week before they said, "You're very nice, but sorry, we can't use you."

Then I asked my professor, Bruce Jameyson, how I could make some money. And he said, "Well, why not teach?" So he announced to his students that Lin was going to give a tutoring class for students taking the senior year structural engineering course.

Q: *You were only 20 years old at the time.*

A: Yes, barely 20. I taught three terms in succession and made a total of something like $800—a *lot* of money at the time! The third time I gave the course, my lectures were so well known that two Stanford students came to attend them.

Q: *Bruce Jameyson was one of several distinguished professors at that time. Charles Derleth, the dean, was probably the most famous in structural engineering.*

A: Both were very close to me. I had a big discussion with Derleth about the analysis of the Golden Gate Bridge, on which he was a consultant. I told him that my new method of

WEST WITH THE PHILOSOPHY OF THE EAST.'

T.Y. LIN INTERNATIONAL: A YOUNG LIN (IN GLASSES) AT THE ENGLISH SCHOOL IN BEIJING IN THE MID-1920S. ABOVE, HIS PLAN FOR THE STRAIT OF GIBRALTAR; AT FAR LEFT, A MODEL OF THE RUCK-A-CHUCKY BRIDGE.

moment distribution could be applied to analyze the Golden Gate towers. He called me into his office, where there were three stacks of calculations, each about two feet high. "Young fellow," he said, "look these over." The calculations had been done in New York, Chicago, and San Francisco; each office had some 20 engineers doing nothing but working on these 42 simultaneous equations, and it still took about six months to finish.

I looked over this work and said, "Heck, they've done this already." But my method could have been used to do what took thousands of man-hours to accomplish.

Q: *You were only 20 years old, yet your method was better than the existing one. Also, by the time you left Berkeley with your master's degree in 1933, you had written your first important paper.*

A: Yes, my thesis, "Direct Method of Moment Distribution," was submitted to the American Society of Civil Engineers, and they published it in 1934. A dozen well-known professors and engineers contributed discussions to it. This really established my relationship with the University.

Q: *After you left Berkeley, you returned to China via Europe, where you stopped on the way to see the most advanced bridges there. Did you stop in some American cities, too?*

A: Yes, I stopped in Chicago and New York and took pictures of all the bridges in those cities. Back in China, I published a series of articles on them in Chinese.

Q: *After the war years, in 1946 you returned to Berkeley and quickly became the foremost specialist in prestressed concrete. It was conceived in Europe, but you helped refine the theory and extend its applications.*

A: A big opportunity came in 1953, when I had a Fulbright grant to go to Belgium and study and write about prestressed concrete. After I returned, in 1954, I published *Design of Prestressed Concrete Structures*, which explained the basic theories and issues.

Q: *Please explain them to us.*

A: Prestressed concrete is simply a combination of high-strength concrete with high-strength steel. The steel is first stretched and then pushed against the concrete. The concrete becomes better by being compressed because it does not crack as easily; the steel works better because it is tightened to a higher strength. So it utilizes the two materials by controlling their stresses. This brought a whole new concept to the design of structures.

Q: *Using this revolutionary material, your private practice became very daring.*

A: As far as actual projects in the field, the first good one was probably the Hippodromo Nacional of Caracas, Venezuela. This grandstand is made of a three-inch shell that cantilevers 90 feet, a new record by about 30 feet.

Q: *Which showed what prestressed concrete could do.*

A: Exactly.

Q: *And it has held up very well.*

A: Very well. We were there a few years ago, jumping on it. Margaret and I visited the hippodrome, and they took us to the tip of the cantilever, 90 feet out. And we jumped up and down and the whole shell vibrated. And they said, "Ohhhh." And I said, "No problem—that's expected."

Q: *Tell us about your famous underslung arch in Costa Rica.*

A: It's the bridge across the Rio Colorado. We had to cross a gorge more than 300 feet deep with a span of 500 feet. How to erect a bridge across such a canyon? The natural way is to use suspension cables. But the valley below has no river traffic; so there was no reason to raise the whole thing above the deck, as was done with the Golden Gate Bridge, where the towers are way above the deck because clearance is needed for navigation below. So, for the Rio Colorado, I figured, you use suspension upside down: build a suspension bridge *beneath* the deck, thus dispensing with the tower and saving a lot of money.

Q: *You have been able to combine your knowledge and experience of the East and the West in your work.*

A: This is very important to me. Chinese philosophy emphasizes two things: how to cultivate yourself and how to cultivate your relations with others. It also teaches a global approach to all solutions. Western civilization emphasizes the relations between man and the physical world, and its research focuses on the scientific. I was fortunate to come here with Chinese philosophy: even when I look at an engineering problem, I look at it from an overall perspective, including its relation to people. And that's why I tied prestressed concrete into aesthetics: I wanted to combine Western methods with Eastern philosophy, to join science and art.

Q: *Let me move into another area. In the 1960s you expanded your*

‘WHEN I RETIRED, I FELT, “I’VE GOT TO DO SOMETHING FOR CHINA.”’

interests beyond engineering into broader social problems.

A: This was triggered by the student movements at Berkeley. At that time I came to appreciate how important society is, even from a strict engineering/technological point of view. I was appointed to start a course called “Technology and Modern Society.” Really, I was not very qualified to teach this course, so I got ten very prominent people—either in technology or in society—to give lectures to the students. One of the ten was Joseph Alioto.

Q: *The mayor of San Francisco at the time.*

A: He was about to run for governor. After his lecture, about two dozen students asked if they could have lunch with him. So I arranged a lunch at Alioto’s No. 8 on Fisherman’s Wharf. The students and I were there when he strode in; he was just like a man running for office—very proud, very friendly, shaking hands all around.

Then we sat down, had lunch, and the students started asking questions, which he answered for about two hours. I saw a gradual change come over him which I didn’t understand at first. By the time he left, he was almost a mouse, this man who had come in like a tiger. He was deep in thought, and he didn’t do any of that political show at all.

The next morning, his campaign manager called me up and said: “Professor Lin, I want you to be the first one to know that Mayor Alioto will not run for governor.” I didn’t quite understand, but I sort of imagined that the students had impressed him so much, with the many questions they brought up which he couldn’t quite answer satisfactorily.

Q: *The 1960s brought up all kinds of issues, not only the Vietnam War but also the misuse of technology, the problem of the world’s ecology, pollution, all sorts of things. The students were aware of these—*

A: Students were aware of them far more than I was, especially about how important the environment was, and how much less important *wealth* was. Students began to change from wanting to be the CEO of a big firm, making a lot of money; they began to think more about practicing their profession, teaching, or whatever, and began to appreciate the other phases of life.

Let me give an example. I was appointed to be chair of the Board of Educational Development. And I thought, to develop education we should bring in some of the students. We had six board members who were professors, and I suggested at a faculty meeting that we should have one student member serve on the commission. They were reluctant. I said: “Look, we have six professors. If the student agrees with all of us or most of us, he must be right. And if he doesn’t, one person doesn’t hurt us. So why are we afraid of his presence? What is the fear?” The motion was passed.

Q: *Was that the first time a student had been appointed?*

A: I believe it was the first time a student was made a member of a faculty board at that level. Now, of course, it’s common. So, you see, I thought it was wise to build bridges between the faculty and the students.

Q: *In the 1970s, it became possible for you to build bridges in another way—between China and the rest of the world.*

A: That’s true. I had brothers and sisters in China all these years. In 1976, I retired from the University of California because my firm had grown so big and I wanted to take care of my professional business and my colleagues, who often were former students. And I felt then, “I’ve got to do something for China.”

In 1980, I proposed a bridge across the Huang Pu River in Shanghai. It didn’t get too much attention at first, because the Communist government didn’t have any money to build it. Then, in 1985, the mayor of Shanghai came to San Francisco. I introduced myself and said: “Mr. Mayor, if I build this bridge for you for free, will you give me some land on the other side of the river? You don’t have to pay for the bridge, and you can develop the entire area. Will you do it?” That nailed down the deal very fast.

TWO TO TANGO: T.Y. LIN DANCES WITH HIS WIFE MARGARET IN THE BALLROOM OF THEIR EL CERRITO HOME.

Q: *At the same time, you’re involved as a diplomat, as a representative of democracy.*

A: Oh, this is very interesting. I’ve become very close with officials in Shanghai, who have since become important persons in Beijing. So I wrote up a six-page proposal on how to modernize Chinese totalitarian rule into democracy. A few years ago, I was invited to China to talk about this. There are a lot of Western ideas on how to modernize China—“You should have democracy tomorrow!” But this is not possible. You have to do it step by step, and you have to have a plan.

So here I am, building bridges again. ☻

Allan Temko, longtime architecture critic for the San Francisco Chronicle, *won a Pulitzer Prize for his criticism in 1990. An occasional lecturer at Cal, he is the author of three books and is at work on a book on T.Y. Lin, sponsored by the Graham Foundation of Chicago.*

PHOTO BY GERRY GROPP

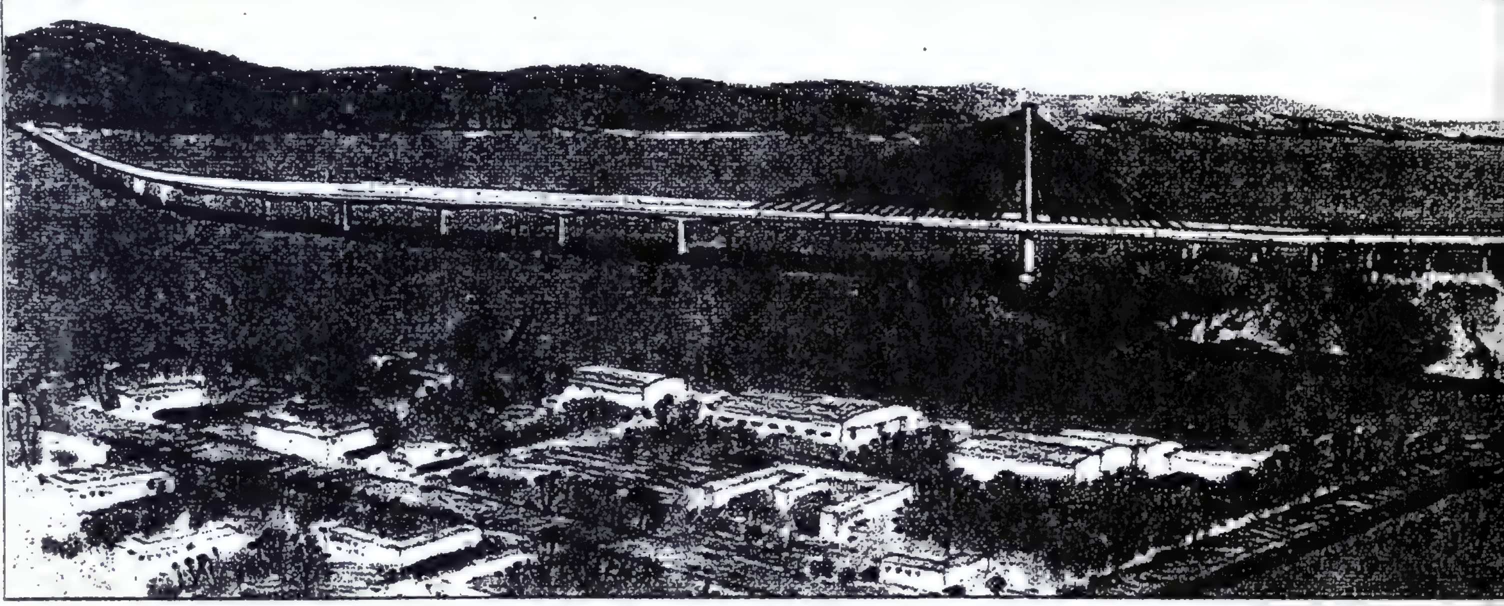
San Francisco Chronicl

NORTHERN CALIFORNIA'S LARGEST NEWSPAPER

MONDAY, MARCH 10, 1997

COMMUTER CHRONICLES

In Search of a Better Bay Bridge Design



DRAWING BY LEO CHIEN/SPECIAL TO THE C

Renowned engineer T.Y. Lin offers a plan that's nobler and costs $200 million less

ALLAN TEMKO

Environmental Design

Caltrans has given the public an impossible choice between two extremes in rebuilding the eastern span of the Bay Bridge — and neither is nearly good enough for this key setting at the heart of the bay.

One proposal is for a dull, towerless "skyway" that has been likened to an outsized freeway ramp. The other is a madly extravagant "signature bridge," slung from two melodramatic towers, that would be a mockery of the great suspension spans to the west between Yerba Buena Island and San Francisco.

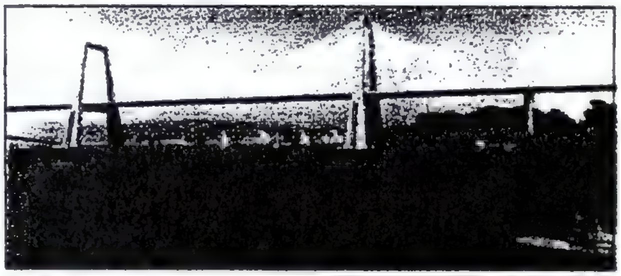
But these schemes are authentic dogs. And there's no reason for us to settle for either of them.

That's why The Chronicle asked the renowned structural designer T.Y. Lin to create a true alternative. And he has responded with a masterpiece that would give the East Bay one of the noblest and most daring cable-stayed bridges in the world.

Under Professor Lin's bold concept, a 200-foot-broad concrete deck — gloriously open to the sky — would span the 1,400-foot main channel in a breathtaking display of clarity and confidence. The deck would hang from a single powerful concrete mast 600 feet high, firmly socketed in rock at the edge of the island.

Lin's idea is very preliminary, and it

BAY AREA: *Page A4 Col. 2*



CALTRANS DRAWING/SPECIAL TO THE CHRONICLE

CALTRANS DRAWING/SPECIAL TO THE CHRONICLE

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San Francisco Chronicle
NORTHERN CALIFORNIA'S LARGEST NEWSPAPER
MONDAY, MARCH 10, 1997

Bay Area Deserves Better, Less Expensive Bridge Design

From Page A1

is of course not the only alternative that could be considered, but it opens up a new realm of possibilities.

Under his plan, only two parallel lines of slender cables, set 20 to 30 feet apart, would run down the center of the deck, dividing the westbound from the eastbound lanes.

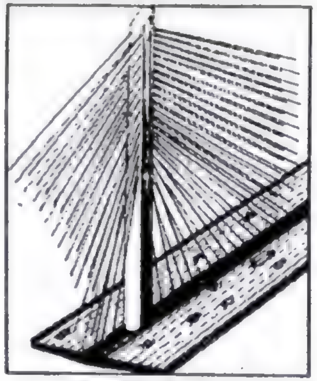
There would be ample room on either side for a bicycle lane, or a shoulder lane for stalled vehicles, because the exceptional width and weight of the precast concrete roadways — tapering at the sides to give them an aerodynamic form (as they would in the Caltrans schemes) — would help keep the deck from lifting or twisting in earthquakes or heavy winds.

The chief key to the stability of this prodigious deck would be a central structural "spine" — a rectangular concrete tube or "box girder," perhaps 30 feet wide and 15 feet deep, running beneath the roadway the full length of the high cable-stayed spans. The cables themselves, anchored along the spine, would further stiffen the entire system because they would be tightened — "prestressed," in engineering parlance — by the tremendous deck loads.

On the shorter approach spans to the east, such a spine would be unnecessary and there would be a gap between the two roadways.

Engineering logic thus creates an elating liberation of space. The single mast has but a fraction of the mass of Caltrans' huge (but hollow) "portal" towers. The edges of Lin's spans are unobstructed, whereas Caltrans would run cables to either side, possibly creating a dense visual effect, like overlapping mesh screens, when seen at certain angles across water.

Lin's cable-stayed concept, moreover, is asymmetrical. The slender cables, more widely spaced over the main span east of the tower, enhance lightness and grace. Like many cable-stayed bridges around the world, it is perfectly balanced dynamically — a poetic paradox of the engineering.



BY LEO CHEN/SPECIAL/THE CHRONICLE

Parallel cables are anchored to the spine that divides the span

Of the two rival Caltrans schemes, the spartan skyway has been priced as a $1.1 billion bargain. The cable-stayed, two-tower "signature bridge" — touted by Caltrans' officials as "elegant," although it has a distinct look of student work — supposedly would cost $221 million more.

The cheaper skyway, or viaduct, would be far less disruptive visually — less offensive in every way — than Caltrans' cable-stayed alternative.

Designed (I've been told by reliable sources) by young Caltrans engineers who had no experience with major bridges, it is a classic case of doing things the hard way. The overblown form makes no sense except perhaps as a ploy in Governor Pete Wilson's long-running political sitcom of sticking it to Northern California.

If the decadent Bay Area wants a pretty bridge, Wilson has made clear in his genial Uriah Heep manner, it can damned well pay top dollar for aesthetics.

I have news for him and his bureaucratic minions. The chef-d'oeuvre by Caltrans' in-house Leonardo da Vincis is a couple of hundred million bucks more expensive than necessary, largely because the two-towered scheme sports one tower too many.

In an age of magnificent single-tower cable-stayed bridges, there is no need at all to build the eastern tower, closer to Oakland, which Caltrans would plunk down on one of the squishiest spots of the bay bottom. Supporting piers for this ungainly flat-topped A-frame would have to be driven through hundreds of feet of mud.

A lot of million-dollar bills can be sunk in that maw, particularly because the splayed-out form of the tower — in contrast to a compact central upright — would increase rather than reduce foundation costs.

The eastern tower would not be unbuildable. You can send a rocket to the moon if you wish to spend the money. But it would be a monstrous boondoggle.

As for Lin's design, the price would be right. One of the professor's notable sayings when outlandish sums are quoted is: "Take away a zero."

In spite of Caltrans' scare figure of $220 million extra for a cable-stayed bridge, versus the skyway, he argues that his concept could be brought in for one-tenth that amount — say, only $20 million to $30 million more — and possibly nothing extra at all if Caltrans encounters unexpected difficulties in building the skyway's piers in the mud.

Finally, the technology for cable-stayed bridges of extreme lightness and astonishing length is well established. We are actually living in a golden age of intrepid cable-stayed spans, including sensational new structures in Sweden, France, Britain, the Netherlands, Canada and Saudi Arabia.

Something of that spirit — the spirit shared by Lin and several other outstanding California designers — is needed now for the eastern half of the Bay Bridge. The main reason the skyway viaduct should be discarded is not its blandness but its inability to lift up our hearts and minds.

The old eastern spans of the Bay Bridge, culturally so unfair to Oakland compared to the grandeur of the San Francisco side, are a mishmash of cantilevered, trussed and girder construction, a Depression-era equivalent of the random confusion of the ugly new overpasses that Caltrans has strewn all around the toll plaza approaches, as if a couple of dozen different engineering groups had perpetrated chaos.

That want of vision, that refusal to seek a higher unity, is why we cannot trust Caltrans, aesthetically or otherwise.

The whole idea of the citizenry choosing between two inadequate bridge schemes, as State Senate President Pro Tem Bill Lockyer would like us to do on the Internet, amounts to something close to a hoax.

Caltrans has virtually conceded its ineptitude by offering to consider any suggestions that independent engineers and architects may submit. Professor Lin's concept should be a formidable contender, for it in fact would enhance rather than compete with the suspension bridges on the San Francisco side.

But the public has the right to see other alternatives, and people will not put up with much more dithering by the hapless crew in Sacramento. It's time to end the farce.

Allan Temko won the Pulitzer Prize for Criticism in 1990. He has fought against designs by the state's engineering bureaucracie since his Chronicle articles in the 1960s helped stop freeway construction in San Francisco and led to the redesign of the San Mateo-Hayward Bridge.

Lin's Designs Unify Eastern, Western Views

T.Y. Lin is renowned for functional and beautiful public works

T.Y. Lin is a builder of bridges between peoples and places. Not only has he conceived visionary (but technically feasible) structures, but he has also sought to incorporate them with both Eastern and Western philosophies.

When he was honored as the University of California's Alumnus of the Year in 1995, his acceptance speech characteristically was a tribute to both Confucius and Isaac Newton, whose principles coexist in his unified world view.

Born in old Foochow, China, in 1911, Tung-Yen Lin — always called "T.Y." by family and friends — came to UC Berkeley as an engineering graduate student in the 1930s and quickly distinguished himself as a structural theorist with a bent for practical building.

He returned to China in the 1930s as a railroad engineer, then was invited back to Berkeley after World War II. He soon became a mainstay of one of the most brilliant engineering faculties in the world, where for the past two decades he has been professor emeritus.

He became internationally famous in the 1950s as the foremost U.S. developer of prestressed concrete. Taking advantage of this revolutionary material, he pushed building technology beyond existing limits in bridges, arenas, convention facilities and other long-span structures of surpassing lightness and grace in Asia and Latin America as well as the United States.

In San Francisco, the 300-foot arches of Moscone Center are his most spectacular achievement. But his single most poetic design, still unbuilt, is for the Ruck-a-Chucky Bridge in the Sierra foothills above Auburn, whose slender 1,300-foot deck — hung from cables anchored in the surrounding mountainsides — would curve freely above a gorge of the American River.

In some ways, it was a forerunner of the daring cable-stayed concept he now proposes for the eastern spans of the Bay Bridge.

— *Allan Temko*

San Francisco Chronicle

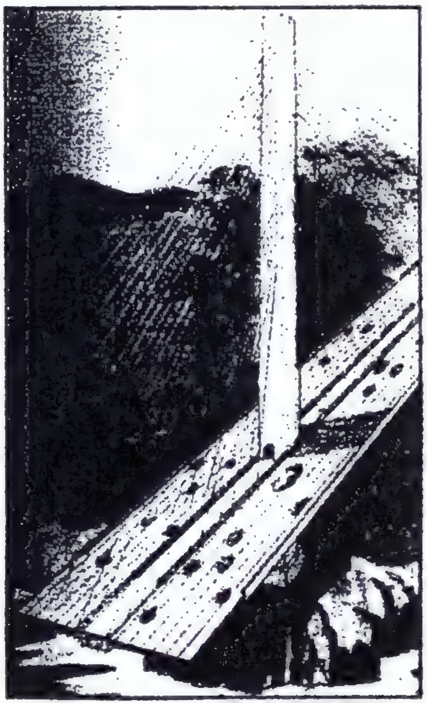
NORTHERN CALIFORNIA'S LARGEST NEWSPAPER

MONDAY, AUGUST 25, 1997

Caltrans Goes It Alone on Bay Bridge Desig

Architects decry decision to limit public inp

A cable-stayed design, one of two finalists for the rebuilding of the eastern span of the Bay Bridge. A rendering of a suspension bridge, the other finalist, can be seen on Page A13



SPECIAL TO THE CHRONICLE

By Carl Nolte
Chronicle Staff Writer

Caltrans has decided that it alone will pick the team to design the new eastern half of the Bay Bridge — a move that a group of concerned architects and engineers says is a big mistake.

They say the choice of design team is the most important factor affecting the look, shape and function of the new bridge, which will be a Bay Area landmark for generations to come.

"If the selection were left solely to Caltrans, we run the risk of not getting the most talented people in the area into the process," said architect Jeffrey Heller, a member of the Bay Bridge Coalition, which includes representatives of major architectural, engineering and civic organizations.

Having a single agency acting behind closed doors choose the design team would be a major switch for the new bridge, which will be the largest and
complex public works project in Ca
nia.

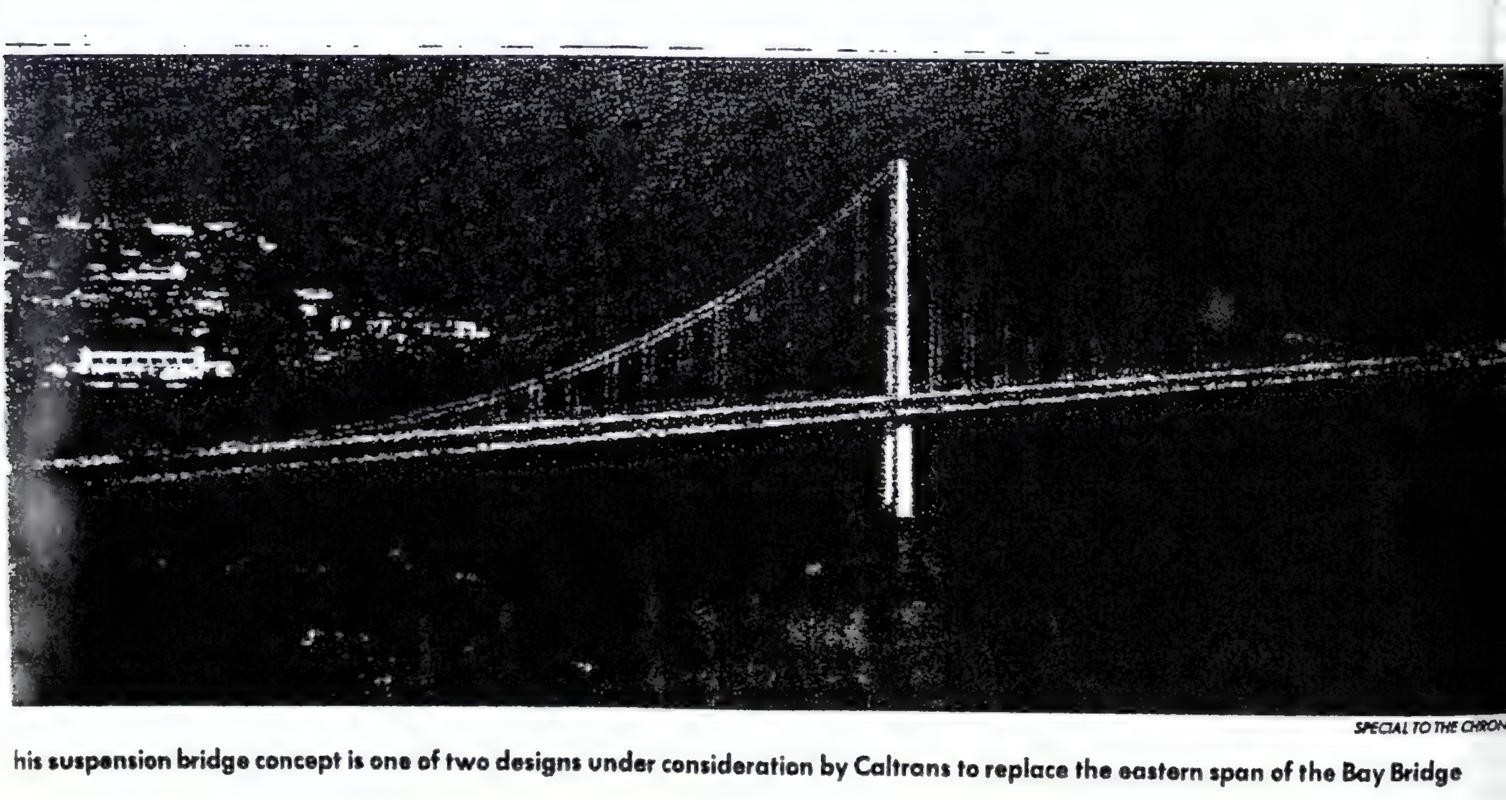
Until now, the state has allowe
Bay Area to decide what kind of b
will replace the East Bay half of th
mous span. The portion, complete
1936, was damaged in the Loma P
earthquake and state engineers fe
could fail in another quake. Replaci
the state said, is a race against time.

The Metropolitan Transporta
Commission held a series of public
ings this spring and solicited advice
a blue-ribbon panel of architects an
gineers.

The process was open, and the

COMMUTER CHRONICLES

BRIDGE: *Page A13 Col 1*



SPECIAL TO THE CHRON

his suspension bridge concept is one of two designs under consideration by Caltrans to replace the eastern span of the Bay Bridge

BRIDGE: Caltrans Says It Alone Will Decide Who Designs Span

From Page 1

mission and the advisory panel received dozens of ideas and concepts of all kinds.

Among the ideas considered and rejected was a viaduct proposed by Caltrans. The agency called it a "skyway," and said it was the best and most cost-effective design, but it became clear that the public disliked the proposal, mostly because it looked like a freeway on-ramp.

If the initial decision had been left to Caltrans, Heller said, "We would have had the viaduct, absolutely."

Caltrans also offered a sketch for a somewhat spidery-looking, cable-stayed bridge with two towers, a concept Heller now calls "clunky."

Both the public and the advisory panel instead favored more elegant-looking concepts — and by June the advisory panel had eliminated the viaduct and narrowed the choices to two.

One is a cable-stayed bridge, the other a suspension bridge. Either would be instant landmarks, with a single tower supporting a graceful new bridge connecting Oakland to Yerba Buena Island.

In July, the MTC picked the two more elegant bridges as finalists and recommended that they be developed to a 30 percent design stage, a level of detail that provides a clear preview of the eventual bridge.

This month, the Legislature worked out a compromise deal to pay for fixing all the state's toll bridges except the separately operated Golden Gate. The bill would come to $2.5 billion; the state would pay half, and the Bay Area would pay the rest through a $1 per vehicle toll surcharge for 10 years.

Governor Pete Wilson signed the bill last week. He said it was the biggest public works project in California.

It is also the bridge of a lifetime — the new east span and seismic work on the San Francisco half of the Bay Bridge would make the bridge last for over 100 years, well into the 22nd century.

The next step is to partially design both options and pick one. Choosing the shape of the new bridge so far has been done in months of open hearings, an unprecedented step for a project this large.

But now, Caltrans wants to shut the door.

"It is a Caltrans process and Caltrans will decide which firm is selected," said Denis Mulligan, the agency's toll bridge program manager. He said the agency is required by law to limit the selection committee to state employees.

To do anything else, he said, would invite a potential conflict of interest among those professionals who might want to bid on the project.

However, the Bay Bridge Coalition thinks Caltrans should include other experts on the selection panel.

"I feel quite strongly that the process should be open to public scrutiny," said Ephraim Hirsch, a structural engineer who is a member of the advisory task force. It is "an absolutely critical decision."

He said Caltrans is spending public money on a project with major impact and should make the decision in public.

The process starts with a document called a "Request for Qualifications," essentially a specification sheet that limits the firms that can bid on the job. Caltrans is drawing this up now and will release it soon, said Mulligan.

Once the request for qualifications is sent out, design firms can submit their credentials and proposals. Then the key decision is made — which firm, or firms, will get the job. It's possible a winning bidder could be some sort of consortium, or that two firms could be selected, one to design a suspension bridge, the other a cable-stayed.

Caltrans will make that selection using its own staff, Mulligan said. But the private architects and engineers say Caltrans needs more help. "That is the issue, the pivotal point that can make or break the project," said Heller.

"You can be sure," he said, "by having a really good design selection group."

Conflict of interest need not be a concern, said Hirsch. The selection panel could include firms or experts who would not bid on the job themselves.

Once the winning bidder or bidders is selected, several conditions must be met. One of them is that the agency "must produce designs — not just design concepts — to sufficient degree of detail to support design judgments concerning seismic performance, cost and visual appearance," according to MTC documents.

There must be a cost estimate for each of the two options, each option must include a provision for a bicycle and pedestrian lane, and there must be provision for future light rail access on the bridge.

The new bridge, according to the Bay Bridge Coalition, ought to be designed to be a beauty. "We don't believe that good design costs more," Heller said.

"There is a belief that good design is icing on the cake," said Charles Bloszies, a structural engineer, "but we believe that the beauty is in the cake itself."

The Bay Bridge Coalition is a group of 30 professionals representing the San Francisco and East Bay chapters of the American Institute of Architects, the American Society of Civil Engineers, the American Planning Association, American Institute of Architects, the Structural Design Association of Northern California, the Greater Oakland Chamber of Commerce, the San Francisco Planning and Urban Research Association, the Oakland Museum, the San Francisco Museum of Modern Art and the Western Construction Consultants Association.

Bay Bridge Design To Lead Traffic Forum

The design of the Bay Bridge — including whether it will get a bicycle/pedestrian lane — is the first topic on the agenda for a public forum next month in Oakland.

The "Unlock the Gridlock" forum will be held on Thursday, September 11, at 7 p.m., at the Oakland Museum of California, James Moore Theater, Oak and 10th streets.

KRON-TV anchor Pete Wilson will be the moderator of the forum, which is sponsored by The Chronicle, KRON, BayTV and KQED-FM.

Other topics include AC Transit and BART service and alternative means of transportation.

Speakers will include Denis Mulligan, Caltrans district division chief for the toll bridge program; Michael Neuman of the Bay Bridge Coalition, AC Transit General Manager Sharon Banks, and representatives of other transit and advocacy organizations.

For free tickets, call (800) 222-6608, log on to the Web site at www.sfgate.com/gridlock or send e-mail to commuter@sfgate.com and leave your name, address, daytime phone number and number of tickets desired (maximum of two).

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Uplift Piles
Struts and Ties
Structural Columns
Combined Pile/Columns
Soldier Beams

100 Slides of T.Y. Lin - Brief Description - Revised 9/12/00

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